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The Struggle for Power

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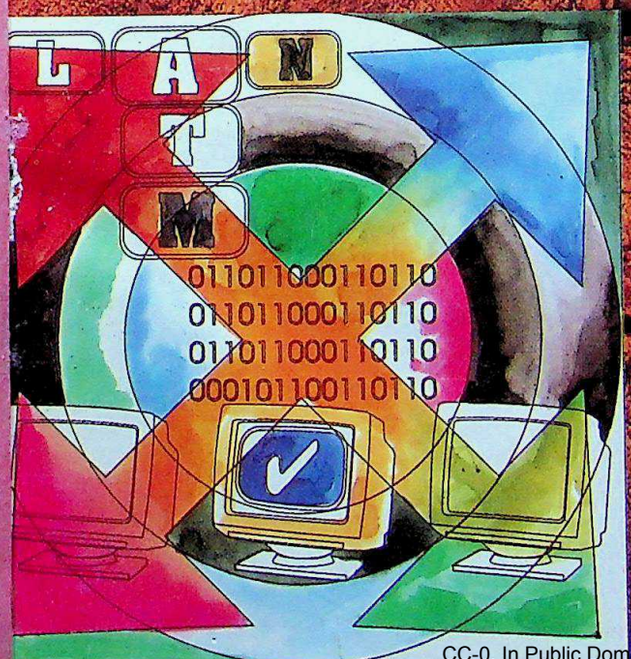
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Private Internet
Intranet Products Change The Way You Work

Bill Gates Careers In Computing & Internet Gold Rush

ASYNCHRONOUS TRANSFER MODE

ATM on the MOVE



2ND ANNIVERSARY ISSUE

Forget About The Potential, The Predictions, The Probable. It's Time to Look at Some Shipping Products.

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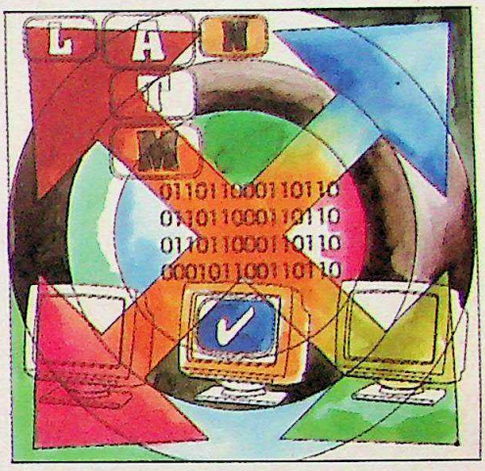
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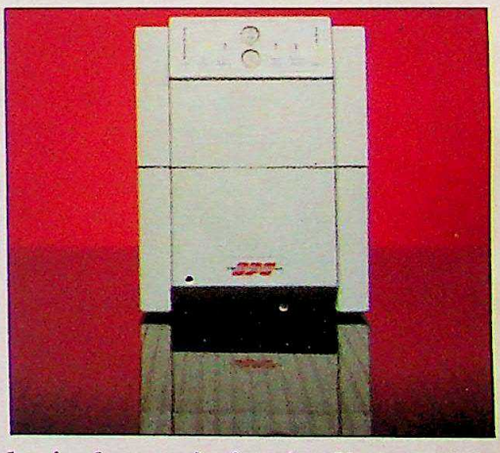
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Although ATM is still evolving, and not all its standards are quite in place yet, this technology of the future is believed to offer compelling advantages. It's time to look at some shipping ATM products. We got a healthy dose of reality as we tested five vendors' high-speed ATM adapters at PC Magazine Labs, West Coast. It was enough to make us say that you'll need to think carefully..... 37

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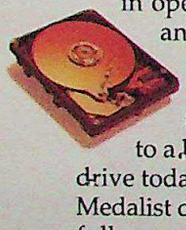
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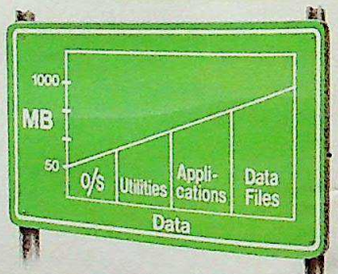


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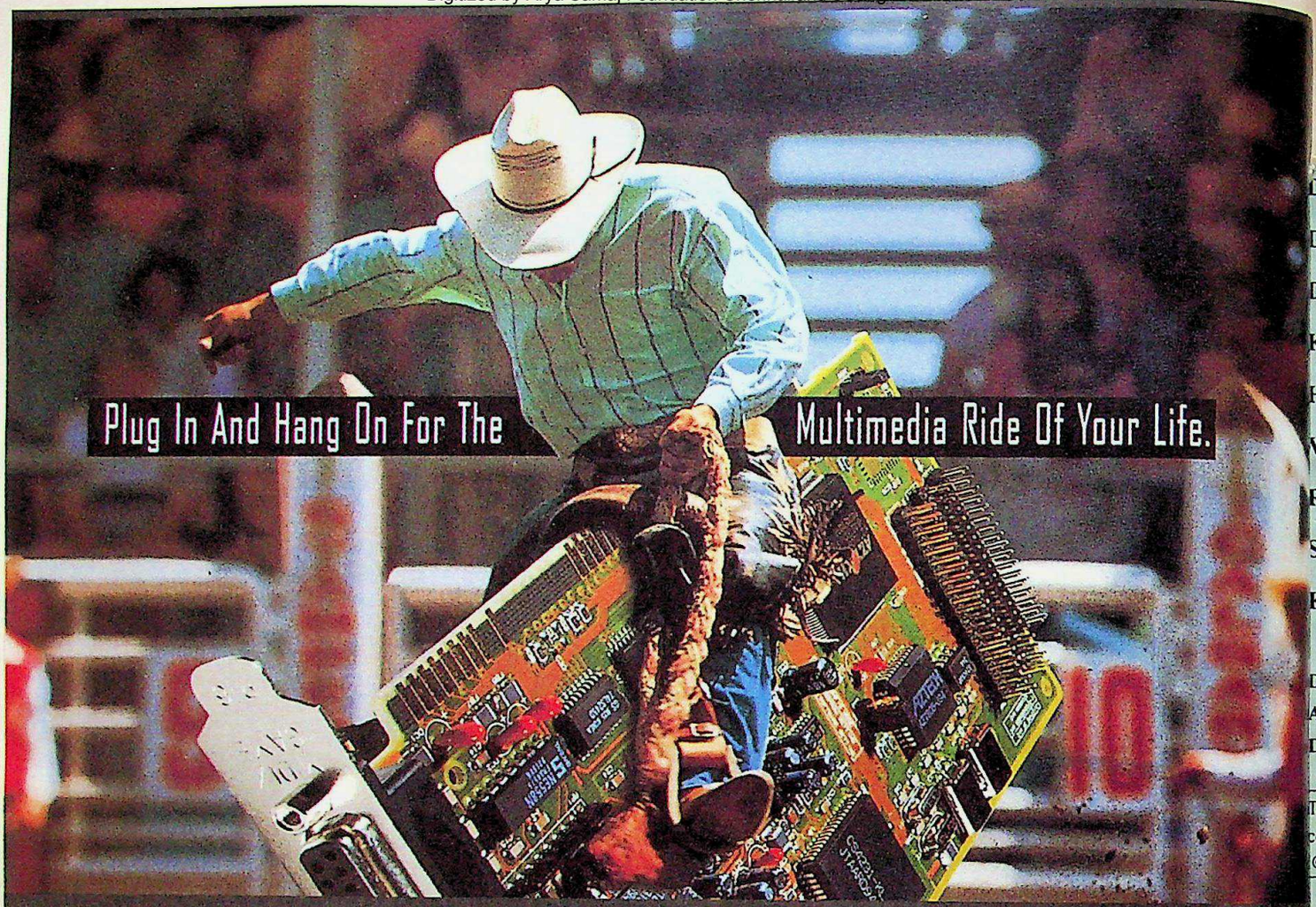
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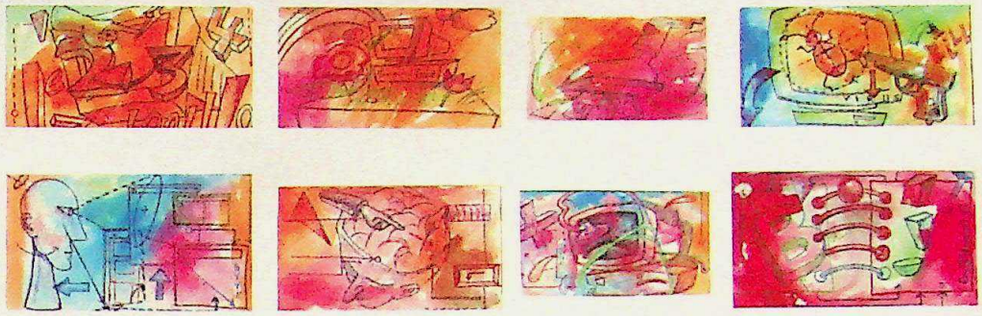
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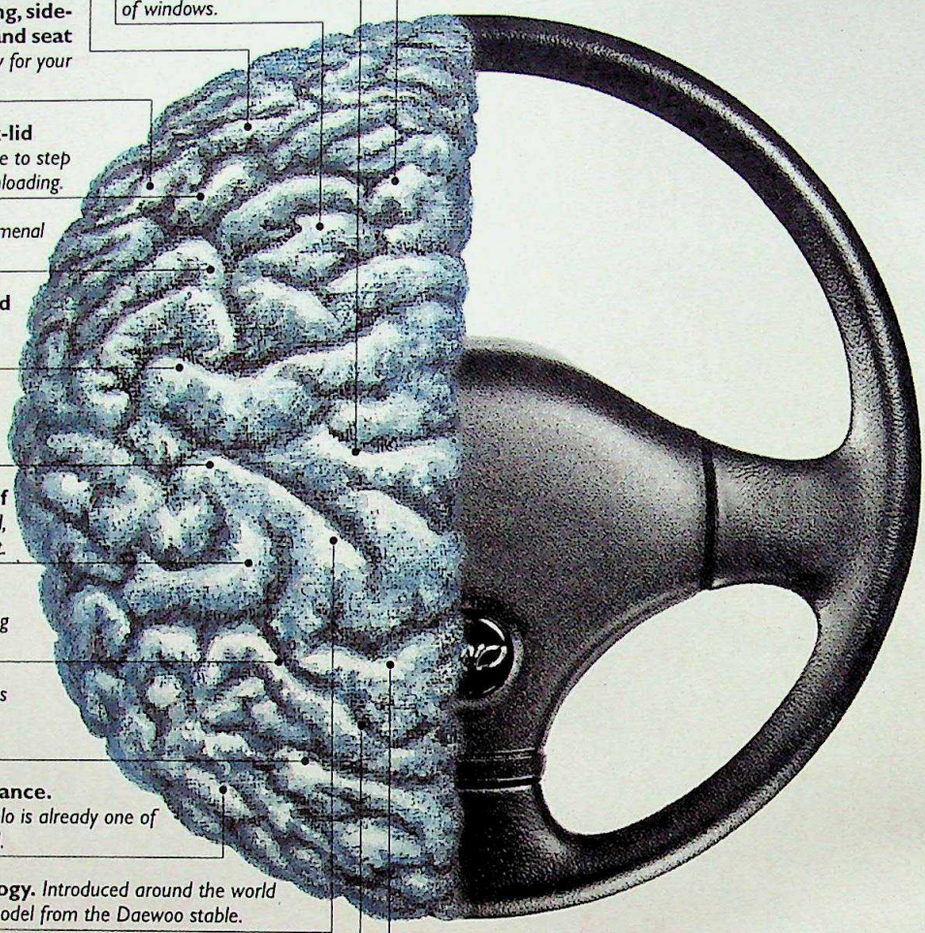
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Ziff Davis Achieves Another Landmark

MICROPROCESSOR SUPPLIERS ADOPT PERFORMANCE RATING STANDARD BASED ON WINSTONE 96

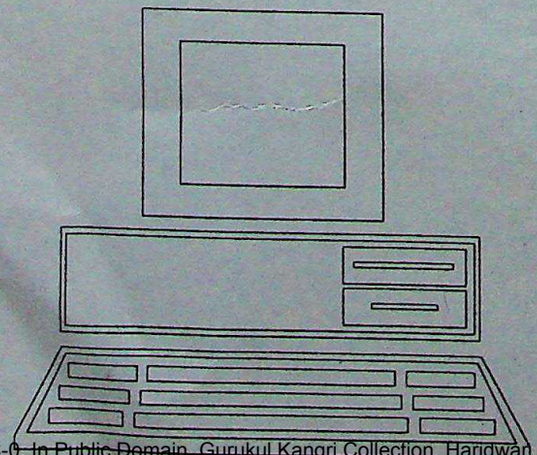
A performance rating standard based on the Winstone 96 benchmark developed by the Ziff-Davis Benchmark Operation (ZDBOp) and used worldwide by the Ziff-Davis Publishing Company's computer magazines has been adopted by **Advanced Micro Devices, Cyrix, IBM Microelectronics,** and **SGS-Thomson Microelectronics** as a new standardized specification to help consumers make PC buying decisions.

The new method indicates how fast a computer actually performs common tasks, regardless of the microprocessor's clock speed, or megahertz (MHz). The four companies call the measurement a P-rating, or performance rating, and are offering it as an alternative way to describe processor performance, instead of the megahertz clock speed measurement now used. The companies say that if consumers buy computers based solely on processor clock speed, they are not necessarily getting an accurate picture of how well the systems will perform real computer tasks.

According to P-rating developers, computer users are more interested in how fast their software applications are actually running. The P-rating indicates this performance level.

AMD, Cyrix, IBM and **SGS-Thomson** sell x86 processors that compete with Intel's processors. The new P-rating evaluation system indicates how such processors perform when compared with Intel Pentium processors. For example, a processor that delivers performance comparable to a 150 MHz Pentium processor is described as having a P150 rating, regardless of its own internal clock speed. "We've been using Winstone at PC Magazine for years, and believe it's the best real-world benchmark of standard business applications," said Michael Miller, VP and editor-in-chief of PC Magazine. "We're pleased with the broad acceptance Winstone has had among our readers, corporate users, and now the industry."

"This is a great endorsement of our benchmarking efforts," added Dan Farber, vice president and editor-in-chief of PC WEEK. "This is further proof of Winstone's status as the standard for evaluating Windows machines."



Winstone 96 benchmark test is a group of 13 common applications that PC users frequently use, such as MS Word and Excel. Test is run on a standardized computer configuration, so that all the results can be compared "apples-to-apples."

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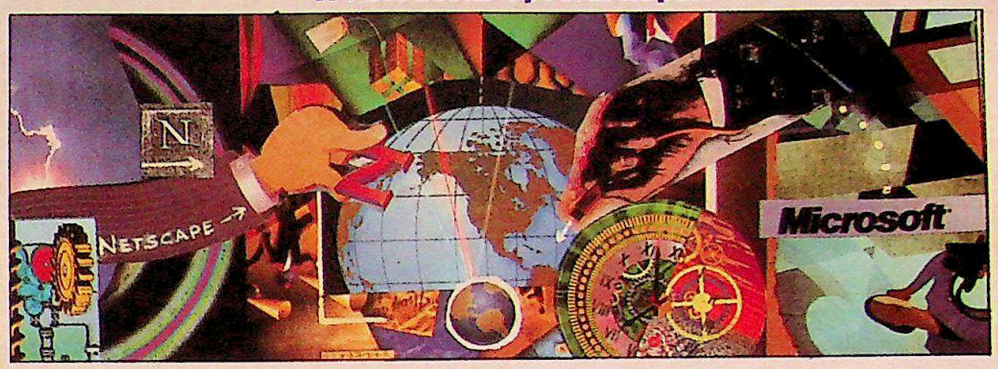
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A First Looks Special Report



THE WEB AT WAR

The Battle for the Future of the Internet

BY MICHAEL J. MILLER The rapid development of the Web has raised the stakes for companies already there and forced the rest to rethink their strategies. With its Navigator browser, Netscape is king of the Internet hill, but Microsoft is vying for the title. We compare their latest browsers and Web server software, review innovative plug-ins and helper apps, and discuss how this framework stacks up against Java and ActiveX. Finally, we delve into the emerging world of electronic commerce and show you the best places on the Web to spend your money. 17

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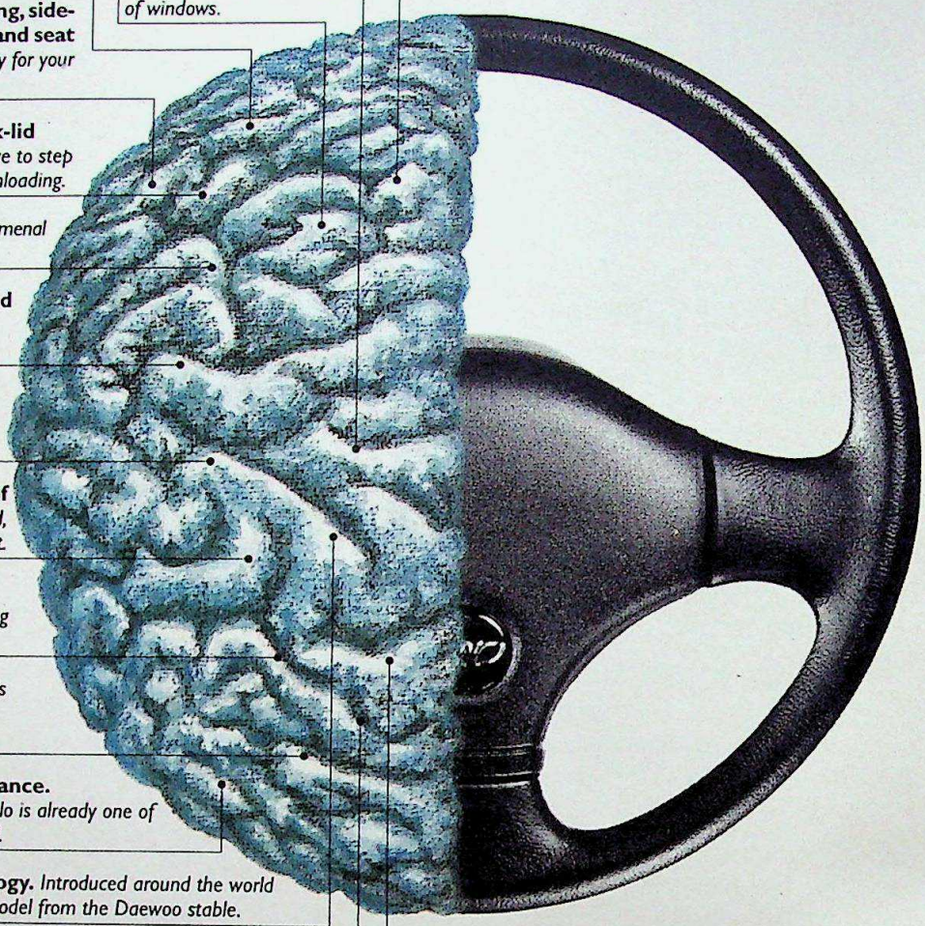
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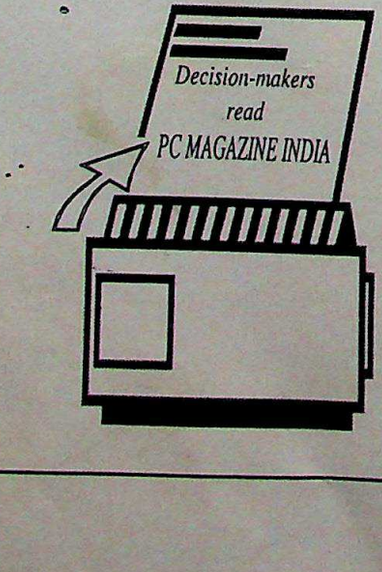
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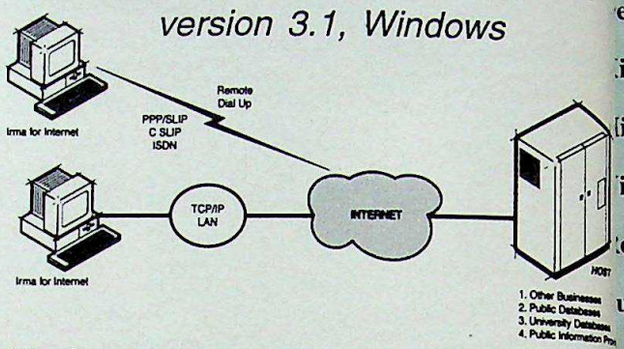


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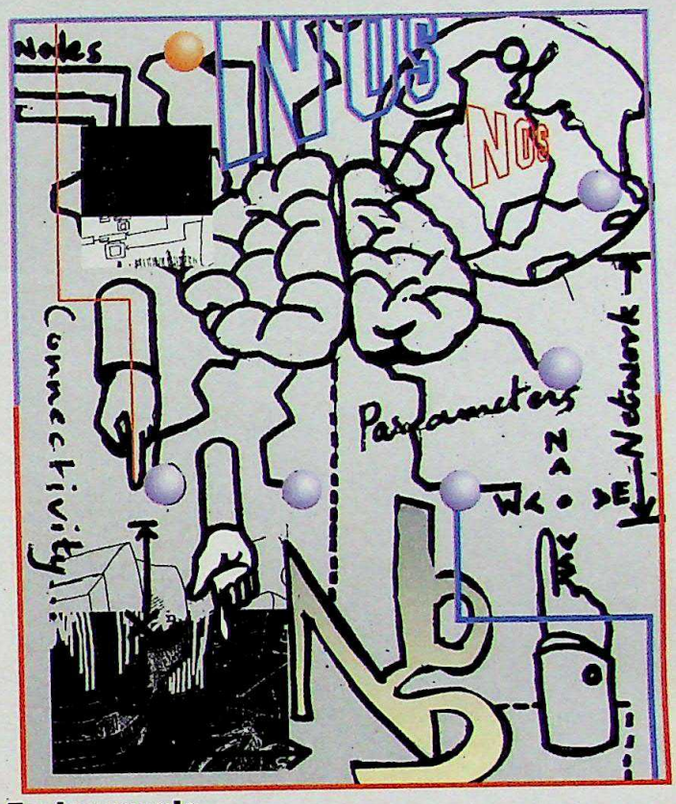
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Network Operating Environments

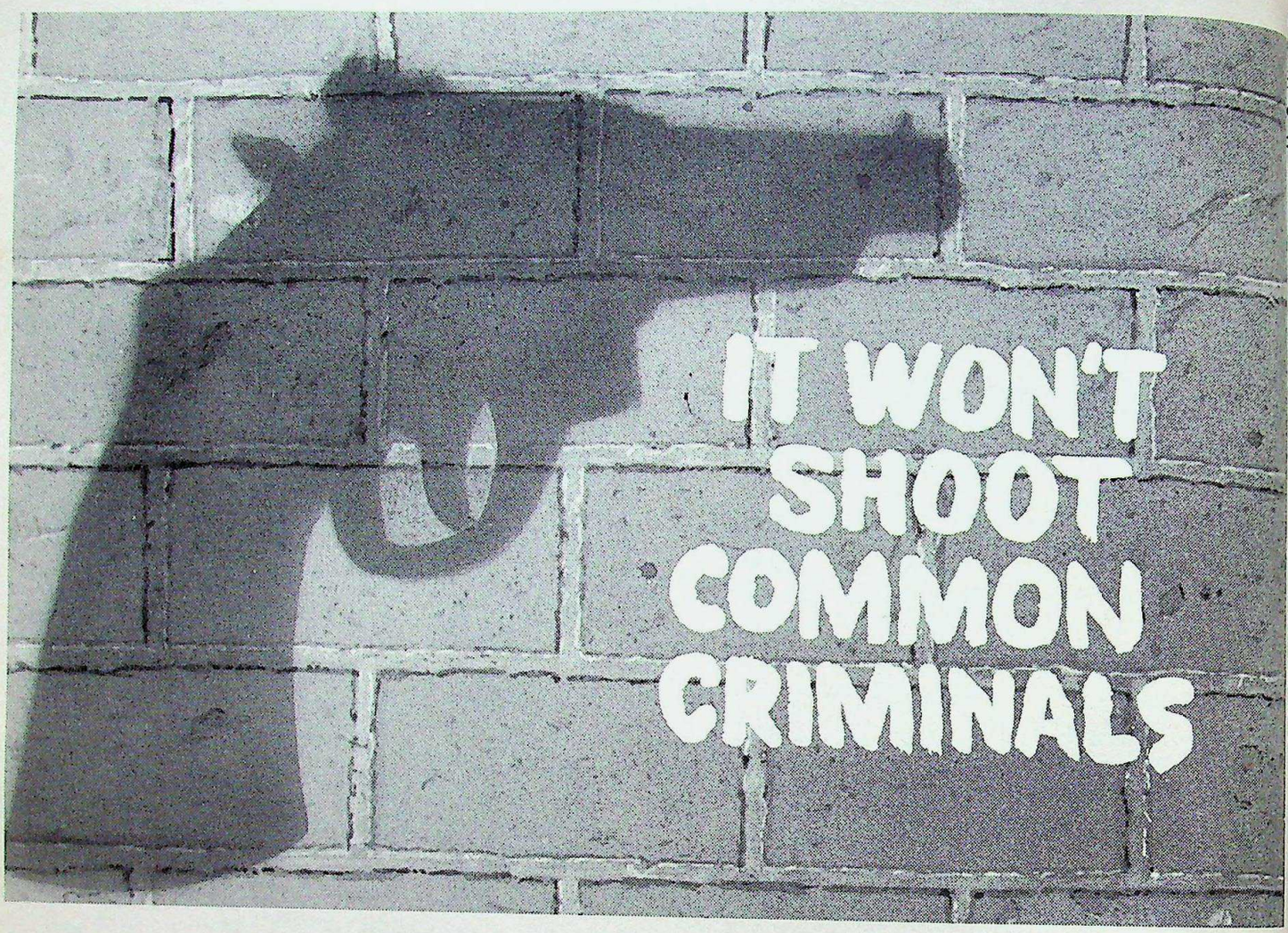
The NOS Evolved

BY FRANK J. DERFLER, JR. Once mere file and print workhorses, NOSs now provide a whole spectrum of services from running applications to connecting to the Internet. NOS vendors are also branching into multiple applications, providing integrated solutions for groupware, database servers, remote access, and Internet servers. But is there really a single platform that can give you all the network services you need wrapped up in a manageable and open but strong and scalable architecture? We test four network operating systems to see how well they'll perform as your total network operating environment. 35

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Share and Share a Lot
BY ALFRED POOR The latest additions to the workgroup and departmental laser family of printers now offer more connectivity options than ever; they're also easier to set up and operate. The printers in this roundup have a wide array of networking features. We test 11 printers that range in speed from 12 pages per minute to 40 ppm in order to help you find the right solutions 57

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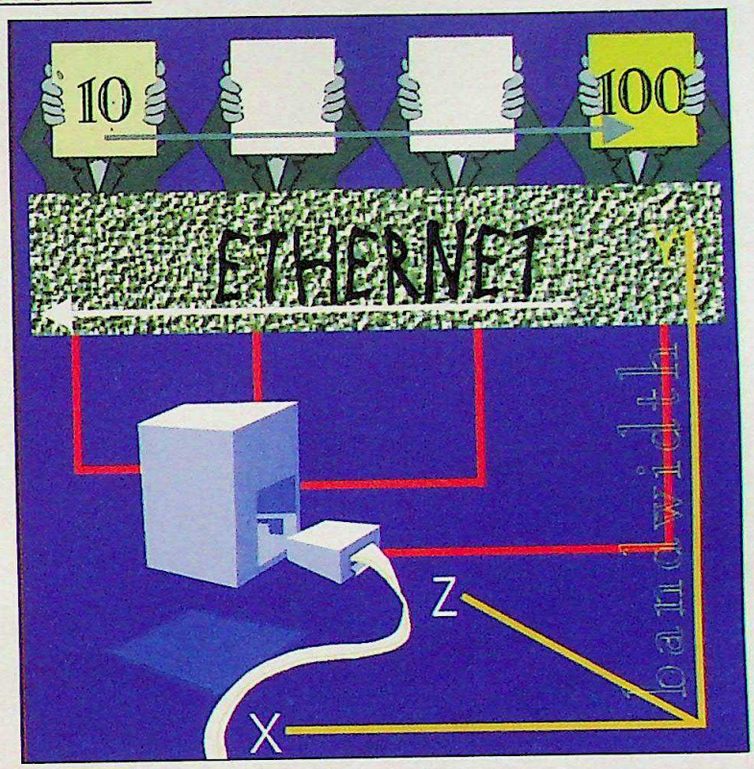
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High-Speed Technologies

The New Ethernet

BY FRANK J. DERFLER, JR. Today you can choose from 10-Mbps switching and 100-Mbps solutions. Which of these approaches is best for you? 31

Deciding when to make the move to a faster technology is one of the trickiest decisions in network computing. You're betting that some new (and cheaper) approach isn't going to supplant your latest hero as soon as you slap down your money.

We give you some guidelines on when and how to adopt Fast Ethernet, the hottest-selling high-speed networking technology. FRANK DERFLER lays out the decision-making process. Whether you should go with (100Base-TX or -T4 or -FX is largely a function of the quality of your installed cable plant and your current and anticipated needs.)

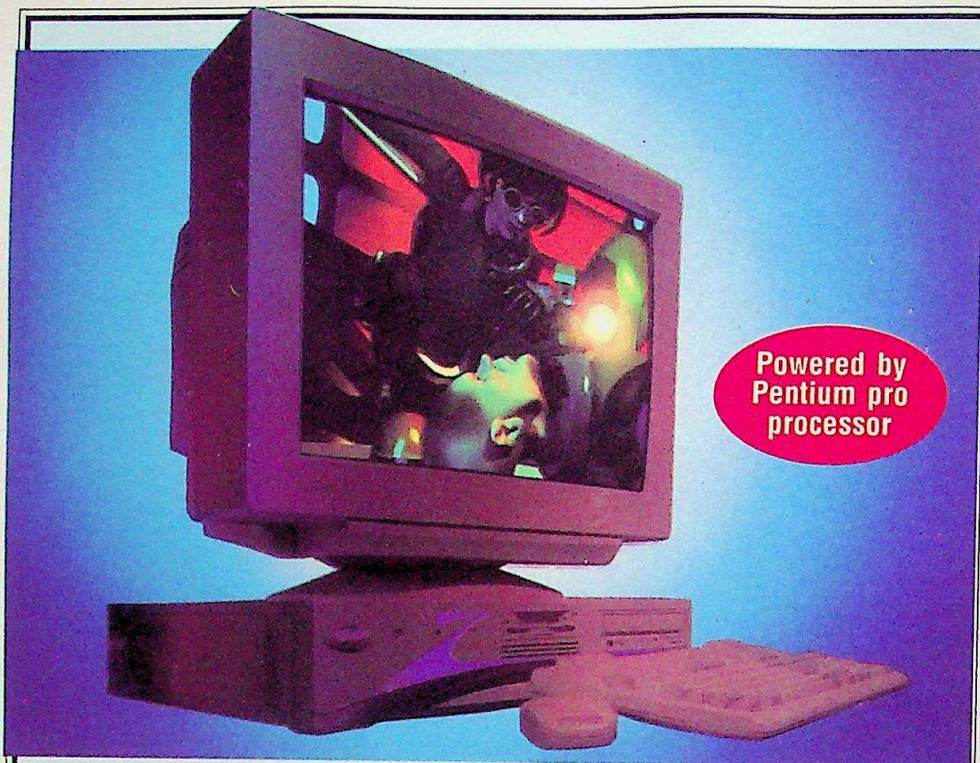
JEFF WITT reviews a product that could be a harbinger of future networking.

STEVE BUEHLER gives us a first look at NetWare 4.1 SMP.

ROB LIPSCHUTZ advices on some new tools you should have on hand to help you with your fast new pipes and connected users.

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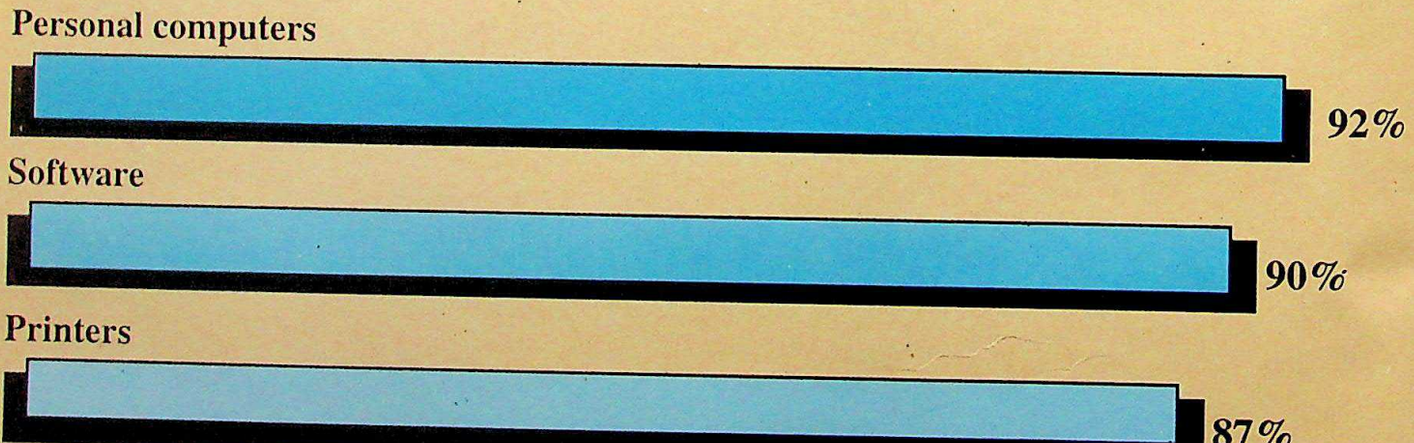
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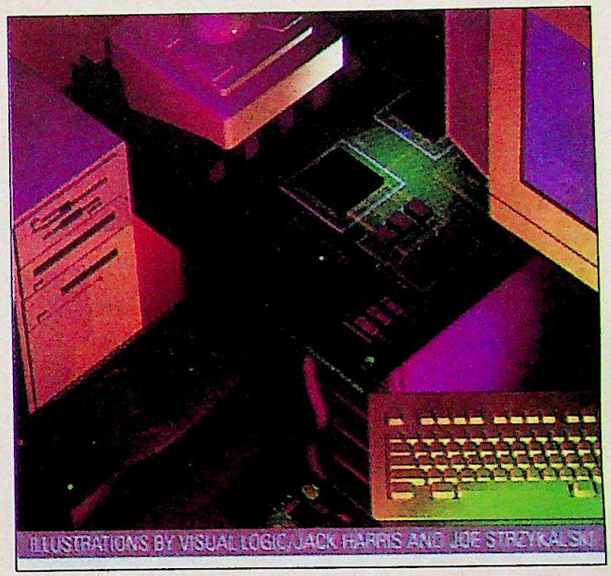
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COVER STORY

THE PERFECT PC

BY MICHAEL J. MILLER How do we define the Perfect PC? Here at *PC Magazine,* we believe there's no one definition that fits everyone's computing needs. That's why, in this issue, we present our view of nine variations on this theme—from the no-holds-barred dream machine to the desktop-replacement portable system to the perfect home PC (including home-office and greater upgrades) and the application server. We explain existing as well as up-and-coming technologies and point out the features and functions you should look for when you are planning to outfit your Perfect PC. 13



ILLUSTRATIONS BY VISUAL LOGIC/JACK HARRIS AND JOE STRZYKALSKI

How to Buy the Perfect PC

Before you purchase your PC, take a look at this special section. We include advice on where to shop and what to buy, the Ultimate Upgrade Guide to help you decide when and what to upgrade, and suggestions on the best ways to use an extra $300 to improve your new PC. You'll also get tips on how to squeeze that last ounce of performance from your current system. 28

The Perfect Components

In this section, we look at the components that come with the Perfect PC. Our coverage starts inside as we consider the perfect processor, memory, and motherboard. Then we look at the components that make up each major subsystem and examine the various peripheral-bus options that are here now or will be here soon. We also help you pick the best graphics accelerator and monitor to fit your needs—whether you are a business user or graphics pro. After an overview of hard disks and removable storage options to help you find better ways to store your data, we visit the perfect multimedia components 40

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The Perfect Connections

BY FRANK J. DERFLER, JR. It has never been easy, but now building and managing the perfect network are becoming even more complex. While network users demand Internet access—and intranet tools provide new ways to share information—network managers must still confront traditional network design and management problems. 64

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The Top 150 Companies—*PC Magazine's* annual guide to the leading PC, server, peripheral, networking, and software vendors—reveals who thrived and who survived a tumultuous 1995 in the PC industry. It's a must for serious buyers 79

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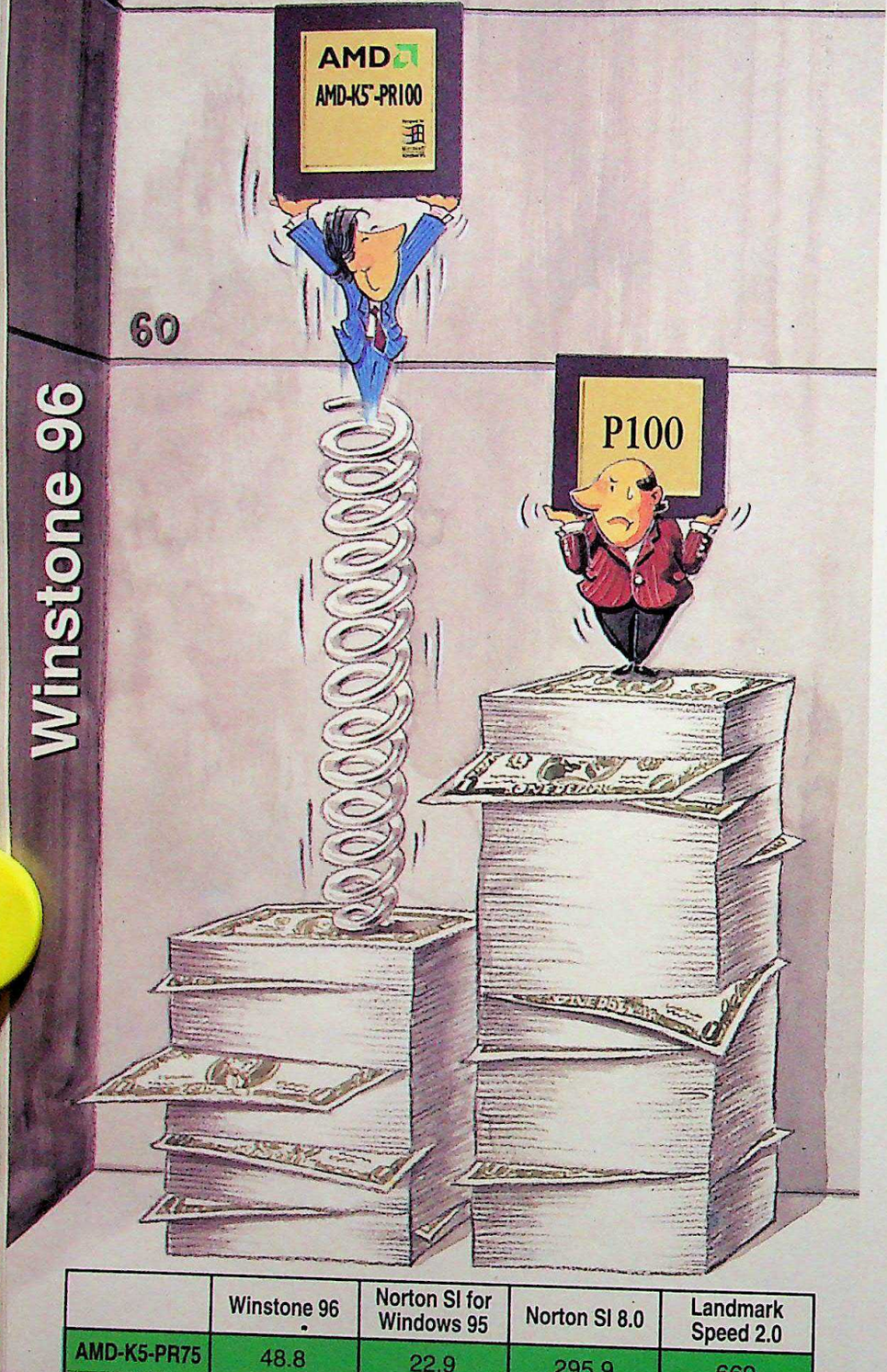
(See also editorial on page 9, Choosing the Best UPS/CVT *on page* 87, *and Dewang Mehta's Column on page* 124.*)*

(In this issue, because of some reasons, we are not carrying the following regular departments: *Trends; First Looks; PC Tech; Abort, Retry, Fail?; Feature Story; News Analyses; IT Shows;* and *Book Review.* Inconvenience, if any, is regretted.

—Editor)

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	Winstone 96	Norton SI for Windows 95	Norton SI 8.0	Landmark Speed 2.0
AMD-K5-PR75	48.8	22.9	295.9	669
Pentium 75	47.4	17.4	236.7	431
AMD-K5-PR90	56.7	27.2	356.5	806
Pentium 90	54.9	22.0	285.2	519
AMD-K5-PR100	62	30.0	394.0	891
Pentium 100	60	24.5	315.2	574

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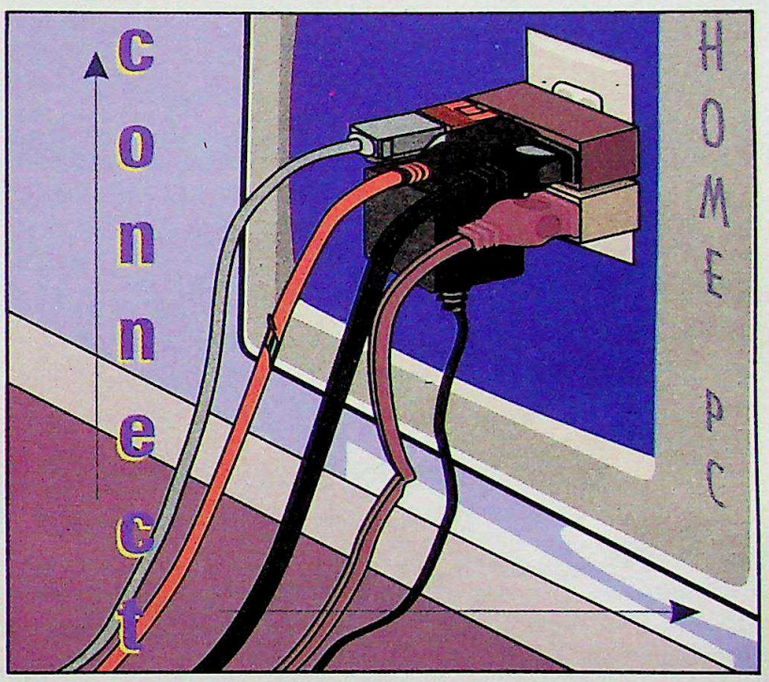
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POWERHOUSE



BY BILL HOWARD Home PCs come in two categories: those meant for more experienced users and those designed for first-time buyers who need a little more help getting to know their systems. We've rounded up 11 of the top home computers on the market and put them through their paces. Find out which machines offer you the most power and performance, which have all the extra touches to make their setup and operation as fast and painless as possible, which come with the extra software and accessories you want, and which one has the best mix of features for a price that fits your budget. 39

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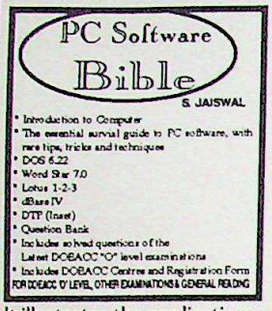
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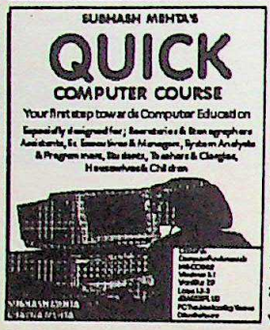


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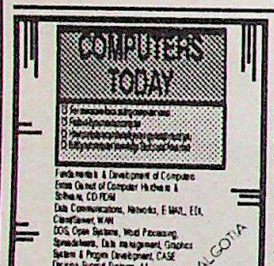
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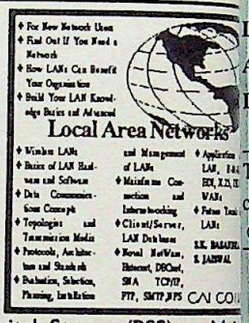
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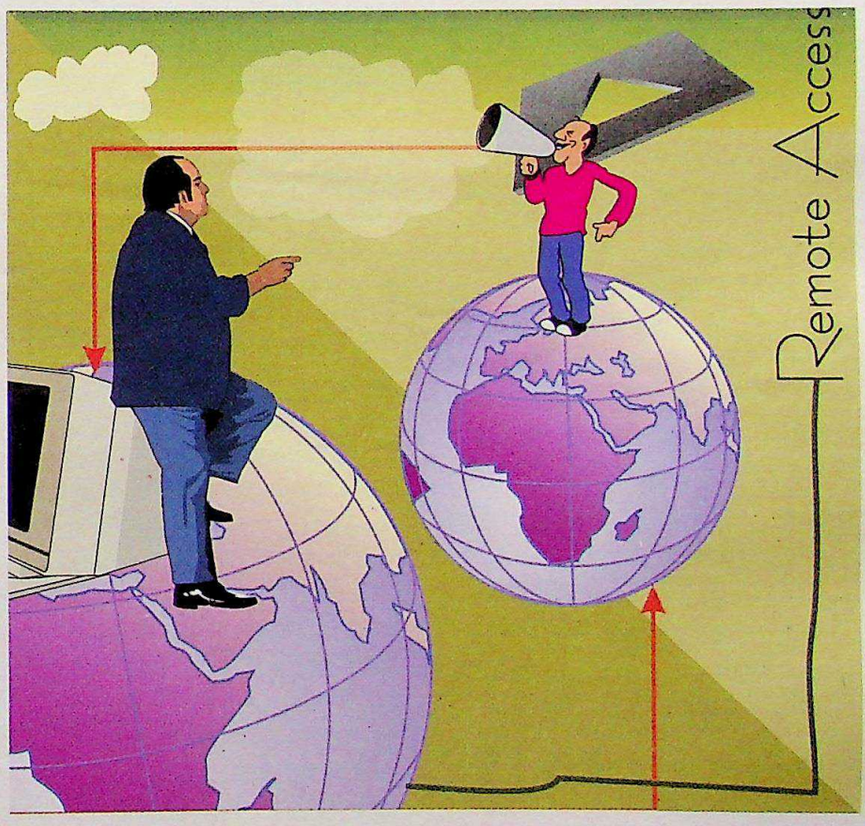
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COVER STORY

REMOTE-NODE SERVERS

A Node from Afar

BY STEVE RIGNEY More than ever, remote-node servers are a great choice for providing users with remote access to your network.



The remarkable adoption rate of remote-access solutions makes one wonder what's next for staying connected over long distances. Around here, we joke about chip implants for enabling mental telepathy. That doesn't seem too farfetched. Anyway, it's hard to imagine doing business without connecting remotely to your desktop, e-mail, online services, or something else.

Today you focus on the services your users need and on how you want to set up the remote access. In this issue of *PC Magazine India*, we review the year's crop of remote-control software packages, and the complementary technology: remote-node servers. Remote expert and contributing editor Steve Rigney takes the lead in covering the subject. 29

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PENTIUM NOTEBOOKS

Portable Property

BY CADE METZ Taking your show on the road no longer means sacrificing the power you're used to having with your desktop PC. Today's notebooks have it all, from 1GB+ hard disks and L2 cache to desktop-size displays and 6X CD-ROM drives. Here is a roundup of 58 Pentium-class portables. 46

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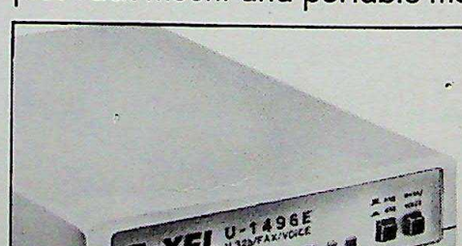
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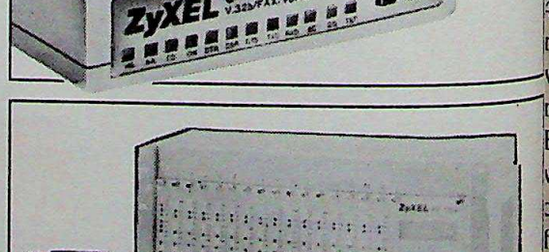
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EDITORIAL

By Kirtimaya Varma

Let 486 Live on

Intel's celebrated forecast that the chip will double its power every 18 months has more or less stood the test of time. It is worth repeating the cliche that the growing power of the chip, which translates into growing power of the PC, has enabled the IT industry to grow so rapidly that if the automobile industry had changed as fast, the Rolls Royce would have hardly cost a penny and would have been of the size of a coin. More and more PC power at lower and lower cost has been the cardinal virtue of the PC industry. This has immensely benefitted the industry and end-user alike. But now, I think, the time has come for us to ponder over whether such rapid technological advance can really be beneficial any more. Afterall, if technology is not for the general good, it can't really be said to be useful, however advanced it may be.

The life cycle of a chip has been gradually shortening. In the USA, 486 started showing signs of obsolescence in hardly two years after introduction, supplanted by the Pentium. Intel has already stopped mass manufacture of 386 chips, and has hinted that 486 too is at the end of its tenure. To the general category of PC users, 486 provides more power than he really needs. An average PC user uses the PC for wordprocessing, spreadsheet, database management, and perhaps networking. For him the compulsion to upgrade to PCs with better processing power is not because he needs more power but because he fears that his existing machines may become obsolete and unserviceable.



One may argue that to get the maximum from investment one should use hardware and software that justify each other's potential. One may even say that sophistication in today's technology doesn't necessarily entail higher cost. These arguments are good if a person wants to buy a new PC. But the problem is that a person is forced to replace his old PC with a new one fearing that his machine will become redundant. If the user feels that all his needs are satisfied by his PC, he must have the choice of retaining his PC without fear. But today the market is entirely seller-driven, or, to be more precise, Intel-driven. By announcing that it will cease the mass production of a particular chip, it pushes that chip into oblivion, and creates an automatic market for its latest chip.

Many in the corporate world may have the money and reasons to go for a new PC just to be on par with technology. In large corporate wars nothing except the latest can provide one with the competitive cutting edge. But for an overwhelmingly large number of PC users the latest is not the best; yet, in an Intel-driven market they have forcibly to choose the latest at the cost of the best.

It is not the end-user alone who suffers. Retailers, traders, and PC manufacturers too seem to be feeling the pinch. Even though the global PC industry is growing at 20%, and 75 million PCs will be sold this year, many PC retailers in major PC markets like USA, Japan, Germany, and Britain are facing bankruptcy, when they should have been minting money. As a case in point, Germany's biggest retailer Escom suffered a colossal loss of $87 million in 1995.

The reason is not far to see. PC retailers are operating at a margin much less than the 20% or more margin for typical electrical and electronic goods. In Japan PC sales shot up by as much as 70% last year; yet, the margin in such buoyant market is as low as 10%, as a result of which several computer shops closed down. In USA this margin is again just 10%. In Britain the margin is higher at 15%, but not high enough to guarantee profitability to retailers.

What keeps margins low is primarily the speed at which new models appear on the market. Innovation is so fast in the PC industry, and new models are coming into the market at such a rapid rate that retailers have perforce to sell off their PCs as fast as they can. By a rough estimate, in advanced countries the price of a PC comes down by 30% in six months. Retailers desperately try to sell off their PCs before their prices fall so as to maximise their profits; they also fear that they may be left with unwanted computers once newer and cheaper and more powerful models are introduced. These factors compel retailers to enter into a cut-throat competition with one another to sell off their ware by cutting their margins.

What is neither in the interest of the end-user nor in the interest of the PC seller cannot, in the long term, be in the interest of the PC industry.

The home segment is emerging to be the fastest growing PC segment in many Western markets. India is just opening up to this segment, but, in due course, home PCs are bound to take off in India. In the USA, 35% of all households possess a computer. Studies by the New York firm Sanford Bernstein shows that the decision to buy a home PC is closely tied to income. Of households with over $75,000 income, 65% own a PC; and of those with over $50,000, 50% own a PC. The likelihood of a family owning a PC rapidly falls with income. In other words, PC users in the largest PC segment are very sensitive to the investment made in PC. If obsolescence of PCs compels home PC users to change their PCs frequently by making periodic investments, it is likely that many of them may not go for PCs at all. In this respect the home PC segment is different from the corporate PC segment, which was the largest PC segment till recently. For the business of the corporate user the change may be a matter of life and death; for the home PC user the change is not at all critical. If he decides against buying a PC fearing rapid obsolescence, a huge market dries up.

I think till the advent of 486 it was in the general interest for the chips to become more and more powerful. This brought more power at lesser cost. 486 is powerful enough to justify the potential of all the software that are overwhelmingly used by PC users. 486 should be allowed a reasonable length of life. Chip technological developments should not sacrifice general good just for the sake of advancing. □

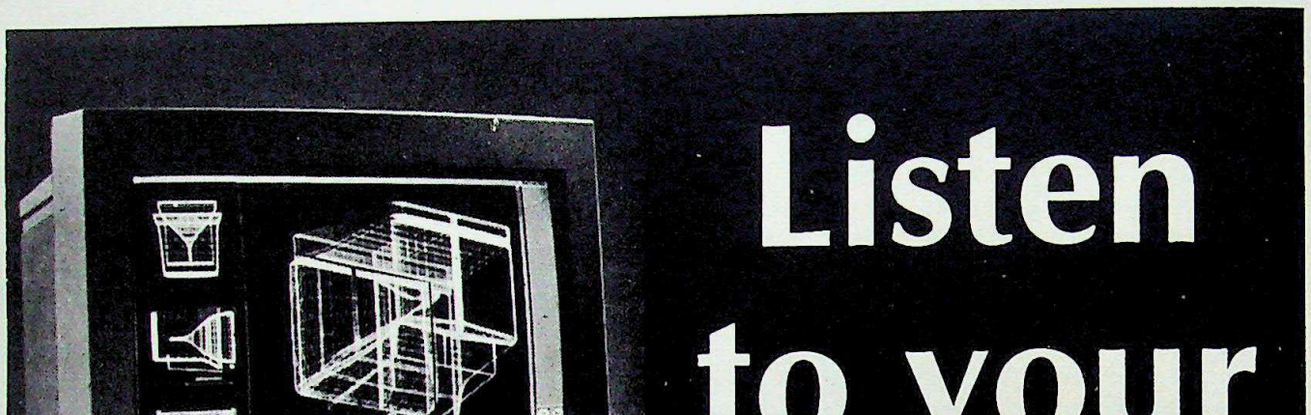
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Trends

TRENDS & TECHNOLOGIES SHAPING THE PERSONAL COMPUTER MARKET

Internet Dial Tone

Telecom deregulation stirs up competition.

AT&T's emergence in the Internet access market is likely to attract throngs of new Web visitors, but it's high-speed technologies like ISDN and cable that will keep them there. Now that telecommunications deregulation has unleashed all kinds of businesses into the competitive arena of providing telecom services, more technologies and competitors are likely to enter the scene.



Hoping to attract its 80 million residential long-distance customers to the Internet with an offer of 5 free hours a month, AT&T debuted its WorldNet Internet service at a splashy introduction in February. Unlimited access costs $19.95 a month for AT&T long-distance customers and $24.95 for all others. WorldNet, which provides connections of up to 28.8 Kbps over standard phone lines, brings with it the clout of AT&T and should pose a concern for small Internet service providers (ISPs).

But AT&T's offerings don't intimidate Netcom On-Line Communications or PSINet. As two of the country's largest and most well-known ISPs, Netcom and PSINet together represent over 400 points of presence on the Internet and have almost 400,000 subscribers. Both also offer technical-support policies and software offerings that match those of AT&T.

So if it's not AT&T that's keeping PSINet CFO Dan Cunningham awake at night, what is? The Regional Bell Operating Companies (RBOCs)—your local phone company. So far, the RBOCs haven't entered the Internet playing field beyond providing the connections between Internet service providers and users. But that may soon change.

Only one day after the WorldNet announcement, reports surfaced that local phone companies, with access to high-speed networks capable of connecting just about every home in the United States, would follow suit. AT&T says its ISDN service will be available this summer, but local phone companies expect to be able to provide high-speed access then as well. Unlike long-distance carriers, local phone companies control direct connections to their customers. Your local phone company has good incentive to deploy fast network capabilities—and soon, says industry analyst Esther Dyson.

The phone companies themselves could face tough competition down the road, now that cable modems are being pitched as the next step in high-speed Internet access. Though industry watchers are quick to question the ever-fluctuating direction of the cable market, Dyson believes the potential is there for cable companies to compete in the Internet access market. "The real shakedown is 18 to 24 months down the

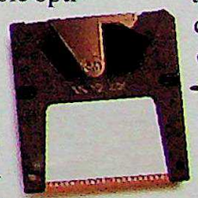
Peripherals Perk Up While Prices Plunge

PC makers cut prices, upgrade components.

Amid signs of sluggish growth in the PC market, computer makers are slashing prices: IBM, followed by Compaq, Digital Equipment, and Hewlett-Packard, recently announced significant reductions.

With an eye toward increasing its market share, Compaq has also made some sweeping—and likely influential—changes to its system configurations. New storage approaches are high on Compaq's agenda. The Compaq Deskpro 5133 and 5166 LS models now use the industry's first 120MB floppy disk drive, while the entire Compaq Deskpro and Compaq ProLinea lines provide options for both rewritable optical drives and scanner keyboards.

Compaq's LS-120 disk drive—developed in conjunction with 3M and Matsushita (Panasonic)—is positioned as a new industry standard. The floppy disks store 80 times as much data as 1.44MB floppy disks and operate up to five times as fast. For higher-end backup, Compaq is offering its PD-CD rewritable optical drive, which works as a standard 4X CD-ROM reader as well as a backup drive that stores data on 650MB cartridges. New Compaq machines will also have a new scanner-keyboard hybrid that lets you scan in paper documents and then edit, file, copy, and fax electronic versions of those documents via PaperPort document management software.



THE 120MB FLOPPY: *New Compaq PCs are big on storage.*

These product enhancements, combined with price cuts of up to 21 percent, can only mean that the company is moving toward a single objective. "Market share, market share, market share," says Kevin Bohran, vice president of desktop marketing at Compaq.—*Cade Metz*

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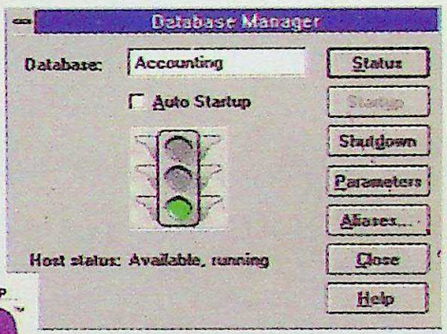
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The Digital NT Dream Machine Oracle Server rewrites the rules of workgroup computing. And that's not surprising, considering it comes from Digital - the company that pioneered 64-bit computing - and Oracle - the world's leading database company.

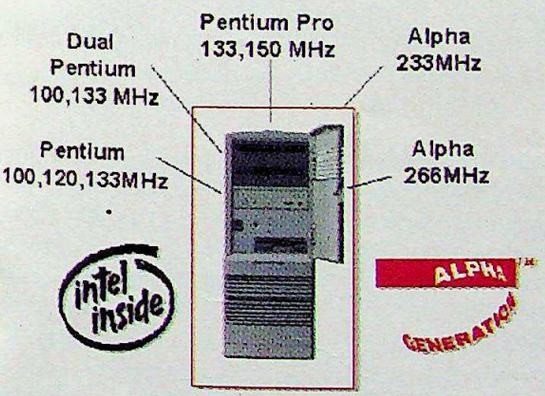


Better performance for a lower price : In fact, you won't get a server that's more robust and gives you better performance. At a price that starts as low as Rs.3.26 lakhs, the Digital NT Dream Machine with Oracle 7 Workgroup Server is truly unbeatable.

More advanced the technology, easier the usage: Oracle 7 Workgroup Server comes pre-configured to meet your most demanding workgroup needs. Its default database structures and tuning parameters are pre-defined, making installation seem like child's play. And its graphical tools combine functionality with point-and-click simplicity.



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Flexible / Scalable today yet operational forever: As your needs grow, the Digital NT Dream Machine Oracle Server grows with you. For the same Oracle runs on any system. From a notebook to huge enterprise servers. You can plug your workgroup into the enterprise-wide computing architecture, effortlessly. What's more, if you feel the need for more computing power, the NT Dream Machine can be upgraded by a simple replacement of the CPU. So if you start with a 100 MHz Pentium Processor-based system, you can upgrade all the way to a 266 MHz 64-bit Alpha processor tomorrow.

All this courtesy Digital and Oracle - the people who write and rewrite the rules of workgroup computing.

For a special offer on the Digital NT Dream Machine Oracle Server, fax Ravi Chauhan at 080 3374601 or e-mail to chauhan@qcav01.enet.dec.com

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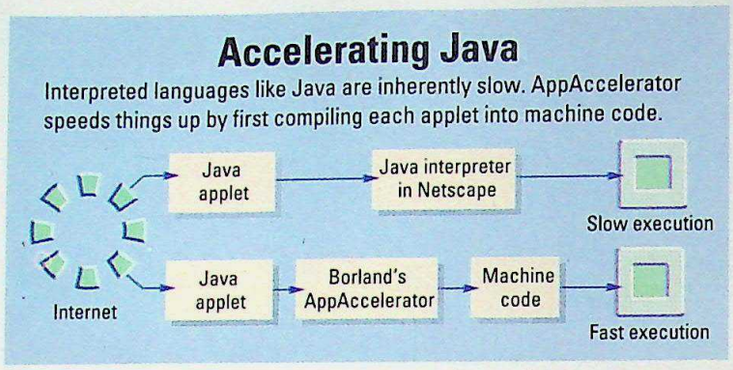
Speeding Up Web Apps

A new Java tool paves the way for cool content.

One of the key challenges of developing applications for the Web is building them so that they run fast. While Sun Microsystems is working on the Java chip, a hardware-based approach to acceleration, others are turning to software-based strategies. Borland, a longtime innovator in development tools, has a new technology programmers can use to turn out applications that fly on the Web.

Borland's C++ Development Suite 5.0 is targeted at general application development but includes several features specifically aimed at Java development. The most intriguing of these is AppAccelerator, a just-in-time Java compiler intended to replace standard Java interpreters.

Java applets downloaded from the Web are usually interpreted by a language engine such as the one included with Netscape Navigator 2.0. Language interpretation is a relatively slow process. Borland's AppAccelerator intercepts the Java program and compiles it into machine code, opening the door to much faster execution—up to ten times as fast, according to the company.



For the moment, Borland is positioning AppAccelerator as a way for developers to run their own Java code during application development. Technically, AppAccelerator can make Java applications run faster for a Web user, but currently, end users cannot license the program. Borland says it's discussing a licensing policy internally.

Ultimately, AppAccelerator could pave the way for bigger and more complex Java applications. In the meantime, plenty of C++ developers will use it with their browsers to speed up their Java applications already out there.—*Thomas Mace*

Lights, HTML, Action!

Behind-the-scenes technology for Web animation.

When the curtain opens on some of today's most visually compelling Web sites, you'll see graphical images that spin, flash, float, and rotate. The techniques used to create such animation are diverse and multiplying, with two new approaches—Moving Worlds and Active VRML—promising mesmerizing Web experiences.

The four most popular approaches to Web animation include a method known as server-push, a .GIF file composed of multiple frames, a Java animation applet, and Macromedia's Shockwave program.

Server-push provides a mechanism by which a Web server and a browser establish an open connection, pushing images until either a CGI script finishes or a user presses Stop. Although server-push does not allow complete control over image speed, this technique can achieve stunning effects.

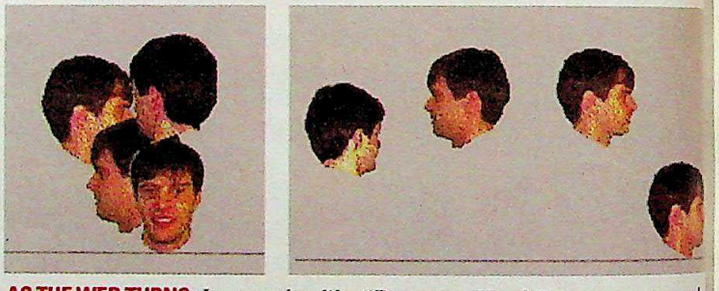
Using the GIF89a format and the GIF Construction Set, nonprogrammers can compose a file out of many images that can be looped and timed. The First Internet Gallery of GIF Animation (*http://www.reiworld.com*) features an assortment of animation.

For interactive animation with sound tracks, a Java applet may be in order. Nonprogrammers can use prebuilt applets by embedding class arguments into HTML, while programmers can use Java's double-buffering clipping techniques. Sun Microsystems' Web site (*http://java.sun.com*) has a number of animation examples.

For high-quality, low-bandwidth animation, Macromedia's Shockwave, a Netscape Navigator plug-in, may reign as king. Shockwave lets designers create sophisticated animation with Macromedia Director and integrate it into Web pages with HTML.

But only VRML 2.0 promises complete immersion in 3-D animation. Two proposals have been submitted to the VRML Architecture Group: Moving Worlds from Silicon Graphics, Sony, WorldMaker, and others and Active VRML from Microsoft. Both proposals build on the existing .WRL (World) format, adding innovations such as timed events, 2-D and 3-D animation, user interaction with objects, sound effects, collision detection, and automatic frame generation.

Apple has added to VRML design efforts with 3D Metafile, a cross-platform format that preserves an object's geometry, color, shading, lighting, and texture. Apple recently announced that it will work with Netscape and Silicon Graphics on Moving Worlds.—*Joshua Kerievsky*



AS THE WEB TURNS: *Java applets like "Bouncing Heads" are one approach to Web animation. VRML 2.0 promises even more complex animations.*

PC Magazine Online Events

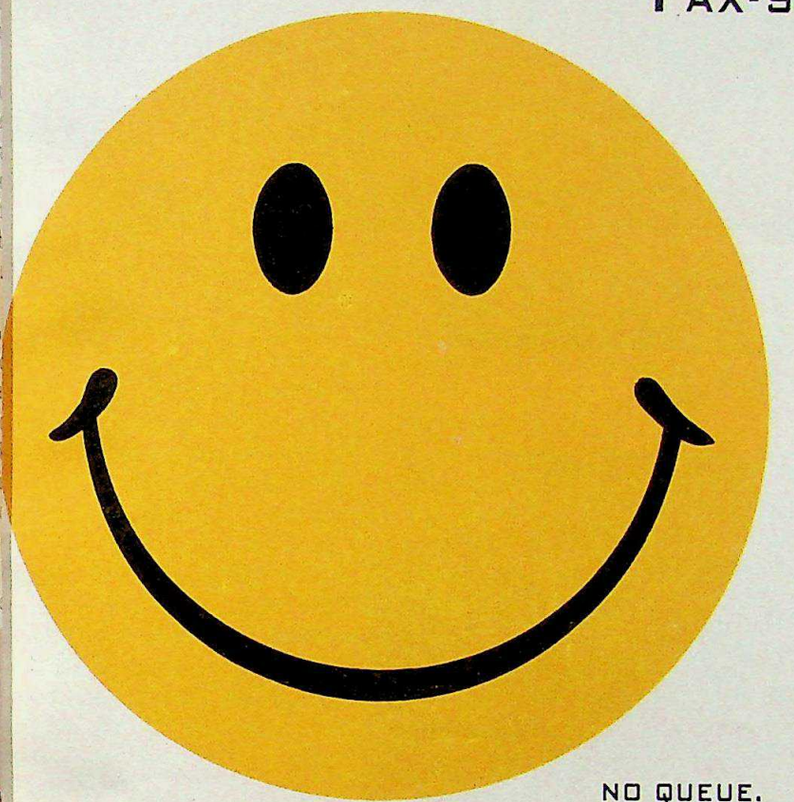
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PC MAGNET. From this online service of ZD Net available through CompuServe (GO PCMAGNET), you can download utilities (GO TIPS) and join in discussions of new products (GO EDITOR). **First Looks Plus:** From April 8 to 12, join a discussion of personal Web page utilities from AOL, CompuServe, and Prodigy with reviewer Edward Mendelson and guests from each service. From April 15 to 19, discuss the Panda Project's Archistrat P166 server with Panda's Jay Starrett and PC Magazine Labs director Bob Kane. **CD-ROM Plus:** From April 8 to 12, discuss Pentium notebooks with associate editor Carol Venezia.—*Tin Albano*

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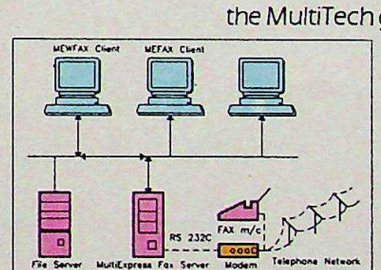
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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

WEB-PAGE EDITORS

AOL, CompuServe, and Prodigy Tools Let You Create a Web Presence

By Edward Mendelson

The race to the Internet's World Wide Web has become a gold rush, and the fastest and easiest way to stake your claim is by creating your own home page through one of the major online services. Until recently, America Online (AOL), CompuServe, and Prodigy did their best to ignore the Web's potential, but today they provide their subscribers several ways to create and maintain personal home pages that are accessible to anyone with Internet access—not just the services' subscribers.

Not only do the Big Three online services provide the software to create Hypertext Markup Language (HTML) pages, but each offers server space to house your Web presence. *PC Magazine* tested these personal Web-page generators and found widely varying levels of functionality, automation, convenience, and cost. If you are eager to experience your 15 megabytes of fame, the reviews that follow may help you decide whether or not to stick with your current online service.

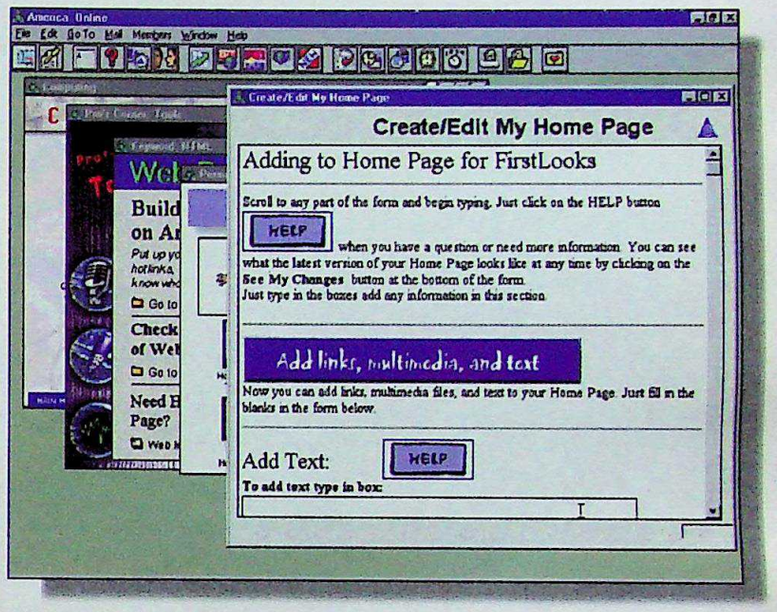
AMERICA ONLINE

America Online gives its subscribers the choice of two different services for creating home pages: My Home Page is for beginners, while My Place is for Web aficionados.

My Home Page lets you fill in the blanks on a form to create a single page in a rigidly defined format. Subscribers are allowed up to five free screen names of up to 2MB each per account.

To access My Home Page, log

Continues on page 20



FILL IN THE BLANKS: *America Online's My Home Page service lets you create a simple Web page by filling in a form. This method sacrifices flexibility and creativity for ease of use and speed.*

SERVERS

Panda's Archistrat 4s Looks to the Future Of Networked Computing

By Robert W. Kane

With the relentless advance of computer technology, you would think that by this point systems—especially servers—that are easily upgradable and expandable would be commonplace. But with BIOS revisions, incompatibilities, and changing I/O architectures, an easy upgrade path remains an elusive goal. The Panda Project, launched three years ago by several ex-IBM employees, hopes to change all that beginning with the $27,000 Archistrat 4s server, which boasts a new connector designed to make entire system upgrades as easy as swapping cards.

The idea behind the Archistrat (the name is an amalgam of *architecture, orchestration,* and *strategy*) is not entirely new. Several years ago, Compaq introduced a Deskpro M line with interchangeable CPU and bus cards, hoping the upgrade craze

Continues on page



BREAKING THE MOLD: *The Archistrat's unusual exterior conceals the server's equally novel system architecture.*

Read First Looks for information on the latest product releases in India and the rest of the world.

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Web-Page Editors

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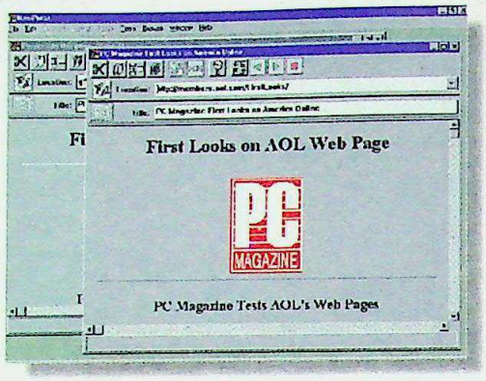
on to AOL and use the keyword HTML. To build your page, you fill in a form that lets you add text, graphics, and links. The text editor is a tiny window that's so primitive that it doesn't wrap words at the end of a line, although we found that the words wrapped properly when displayed in a browser. When you want to add additional text blocks or links, they are inserted after the text and links you created earlier.

My Home Page is not nearly as flexible as it should be. For example, if you want to change the order of your text blocks and links, you have to delete the earlier ones, insert the new ones, and then retype the earlier ones. After each change, you have to view the change and then return to the editing form—a painfully tedious process.

You upload graphics to AOL's server from your hard disk by following a laconic set of prompts. Links can include a visitor-counter provided by AOL as well as a prompt that opens a "mailto" window for others to send mail to your AOL e-mail address.

Near the top of the page is a list of personal information, including entries for marital status, interests, and other items. You can leave individual fields blank, but you can't remove the list of fields, and your page will display "no response" next to those left blank. You can also specify whether your page will be visible only to you, only to other AOL members, or to the world at large via the Internet and AOL.

Many beginners will be happy to be able to create a Web page during their first session, but the page-editing procedure is awkward and time-consuming, and

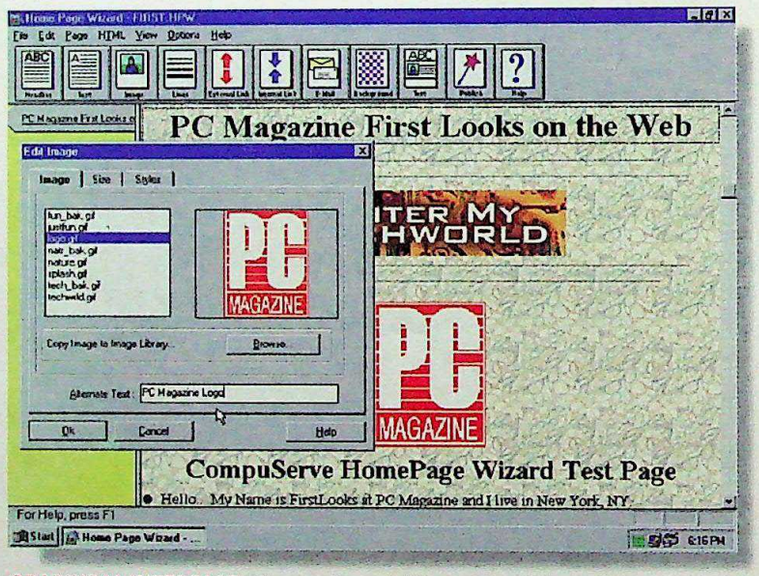


BROWSER: *NaviPress 1.1, the HTML editor available from America Online, includes a built-in Web browser.*

therefore costly because you can only modify your pages while you are online.

AOL's more complex My Place service lets you create Web pages off-line using any HTML editor. You maintain your Web site with an online utility that lets you upload, delete, or rename files. The process forces you to cycle through My Place's menus repeatedly for each file you upload. You can create subdirectories on your site, but you'll need to be well versed in Unix commands to do so.

Your Web site doubles as an anonymous FTP site, with any files and directories that you create available to anyone who knows your screen names; the files in your Private directory can't be accessed by others. Visitors can upload files to your site if you create an */incoming* directory. Although you can use any HTML editor to create Web pages with My Place, AOL steers you to NaviSoft's editing software, NaviPress 1.1; you can use the software for 30 days at no charge. To continue, you have to sign up for NaviSoft's home-page service on the Web, which is entirely separate from AOL.



GRAPHICAL INTERFACE: *CompuServe's Home Page Wizard creates Web pages without offering even a glimpse of HTML code.*

NaviPress is a powerful but slightly clumsy HTML editor that includes a built-in browser. You edit pages in WYSIWYG mode, optionally cutting and pasting from a browser window into an editing window. Alternatively, you can edit a remote file in your browser window and then save the file to your hard disk. An optional window lets you work with raw HTML files, but your changes aren't displayed in the WYSIWYG window until you switch back to it.

Surprisingly, NaviPress isn't integrated with AOL's software. This means that you can't use NaviPress to browse the We while online with AOL; you need a separate dial-in or net work connection to a different I ternet service provider. NaviPre also lets you create pages usi up-to-date HTML features th can be viewed in Netscape Na gator or Microsoft's Internet A sistant, but these items won't di play in AOL's Web browser.

Subscribers to AOL have a cess to a generous supply of di space for their home pages, alo with a wide range of features. B they must choose between th simplicity and integration of M Home Page and the far mo powerful standalone NaviPre editor in My Place.

America Online My Home Page My Place. Requires: 4MB RA 6MB hard disk space, Ameri Online for Windows Version 2 Microsoft Windows 3.1 or later Windows 95. America Onli Inc., Vienna, VA.
(No Indian partner.)

COMPUSERVE

CompuServe lets its subscribe create visually spectacular We sites without requiring them know anything about HTML, r duces connection charges to a absolute minimum, and automa ically uploads your Web site files to CompuServe's server. Th Web-page editing software pr vided by CompuServe OurWor is easier to use than anything el available.

You get 1MB of hard di space at no extra charge, b that's the limit, even if you're wi ing to pay for more. CompuSer plans to offer more extensi Web-site features for busine use in the future.

You start by connecting CompuServe with WinCIM, a then you visit the HPWIZ foru From there you can downlo the Home Page Wizard, whi you install on your hard disk.

Creating a Web presence CompuServe is a two-st process. Start with the Ho Page Wizard, which helps y create a home page or a full se interconnected pages, comple

Product Reviews in *PC Magazine India* enable decision-makers in the corporate sector to select the products that meet their specific requirements.

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ADVANTAGE

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after an expert evaluation. The others evaluated were

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GENERIC FILE SCANNER	YES	NO	NO
VIRTUAL INDICATOR (IBVC)	YES	NO	NO
CLEAN WITHOUT CLEAN DOS	YES	NO	NO
STOP VIRUS WHILE COPYING	YES	NO	NO
CLEAN FILE VIRUSES WITHOUT DESTROYING FILES	YES	NOT ALWAYS	NOT ALWAYS
THREE YEAR WARRANTY	YES	NO	NO
PRICE (In Rs.)	1888.00	3000.00	N/A

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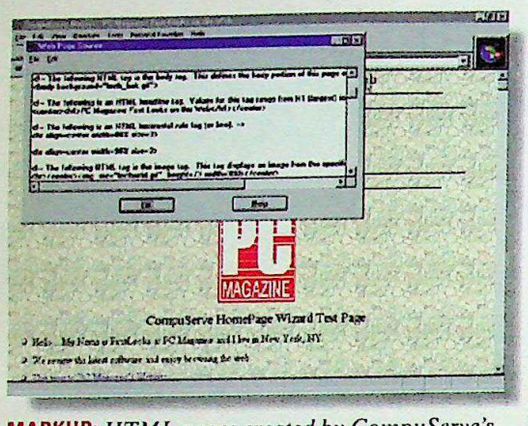
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MARKUP: *HTML pages created by CompuServe's Home Page Wizard are heavily commented, as seen here in CompuServe's Web browser.*

with support for graphics backgrounds and sample images. Then the Publishing Wizard gathers all the files together and automatically uploads them to the service. These tightly integrated programs shield you from HTML codes and the tedious file management procedures required by AOL and Prodigy.

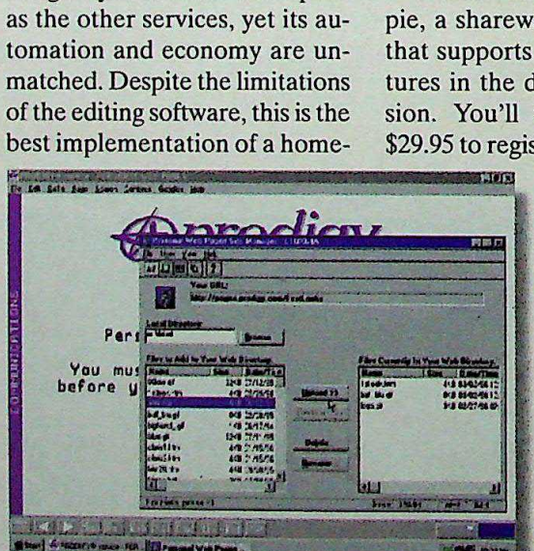
You work with *projects,* or collections of pages, that together form your complete Web site. Graphics, lines, and text are inserted in individual pages either by typing directly in the editor window or by dragging icons from a toolbar, and you can move text or other page elements simply by dragging them.

The help file warns you that you can't import HTML pages from outside the program. HTML features such as graphics backgrounds and "mailto" fields are supported, but the software can't create tables or forms. Until you're ready to upload the files to the CompuServe Web server, all the pages the software creates remain in a proprietary format.

The Publishing Wizard provides a step-by-step sequence for moving your files to CompuServe. The program knows which pages and images you included when you created your pages but gives you the option of adding other files. The wizard then dials into CompuServe and uploads the files automatically. The first time you run the Publishing Wizard, you can choose a user name such as "Mary_Jones" instead of your CompuServe account number. You can delete all files on your site at once, but the software won't let you delete individual files. If you want to include HTML features not supported by the editor, you can use any third-party HTML editor and then use the Publishing Wizard to upload the revised files, but the next time you open the editor, it will display only the versions that were originally created in the editor.

We suggest you look into Hpman, a $17 shareware editor by Heinz Ableggen that replaces the Home Page Wizard. Available in CompuServe's INETPUB forum, this program lets you work directly with ordinary HTML codes but organizes files in the same kind of "projects" created by CompuServe's editor.

CompuServe OurWorld does not give you as much disk space as the other services, yet its automation and economy are unmatched. Despite the limitations of the editing software, this is the best implementation of a home-page service available in today's marketplace.



UPLOAD: *Prodigy's Web-site manager software transfers files between your hard disk and your Web site.*

CompuServe OurWorld. Requires: 4MB RAM, 8MB hard disk space, Microsoft Windows 3.1 or later or Windows 95. CompuServe Inc.,Columbus, OH. *(No Indian partner.)*

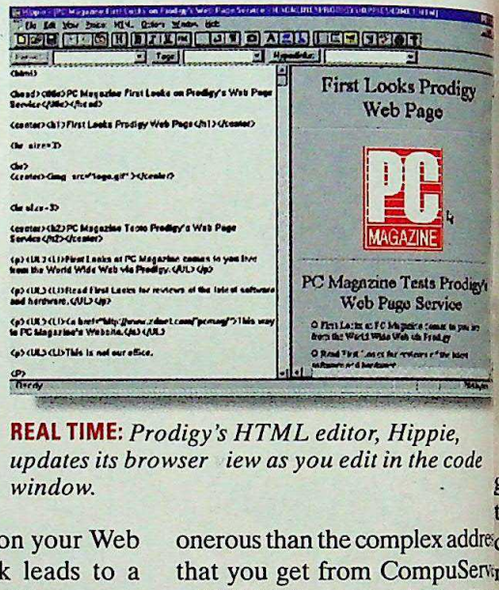
PRODIGY

Hidden behind Prodigy's dreary interface is an online service that tries hard to be friendly. Unfortunately, only the least friendly parts of Personal Web Pages were operating during our testing.

Prodigy allots subscribers 1MB of free Web-site disk space; an extra 2MB, 5MB, 10MB, or 15MB can be had for a monthly rental price of $1 per megabyte. You create pages off-line using any HTML editor and then upload them using a File Manager–style utility.

The opening screen for Personal Web Pages contains a link to launch the utility that manages files on your Web page. Another link leads to a Web page from which you can download Trout Software's Hippie, a shareware HTML editor that supports basic HTML features in the downloadable version. You'll want to pay the $29.95 to register Hippie and get support for advanced features, such as tables.

Hippie displays your HTML pages in a two-paned window: One pane is for editing text and HTML codes, while the other displays the file as it will appear in a browser. This unique real-time display lets you spot errors without testing the file in a browser. One annoying limitation is that you have to scroll the browser-style window by hand to make it display the same part of the file in the editing window.



REAL TIME: *Prodigy's HTML editor, Hippie, updates its browser iew as you edit in the code window.*

The utility that maintains files on your Web site makes file management easy. A list of files in a directory on your hard disk appears on the left, and a list of files on your Web site appears on the right. You simply highlight files for uploading, downloading, deleting, or renaming, and the utility does the rest. This utility won't create subdirectories on your Web site. Like AOL, Prodigy gives you a simple address for your Web page, less onerous than the complex address that you get from CompuServe.

HTML Scratchpad, Prodigy's online software that lets you fill in the blanks to create a Web page, had been withdrawn for upgrading during our testing. The forthcoming upgrade, which should be available by the time this issue appears in print, will include templates that let you build just about any standard HTML feature, including Virtual Reality Markup Language (VRML).

Don't expect support for the extensions to HTML provided by Netscape and Microsoft. Prodigy's built-in Web browser remains relatively slow and primitive.

If you're already committed to Prodigy, you'll find everything you need to create your own Web persona, but Prodigy's slow performance and primitive interface detract from an otherwise solid implementation.

Personal Web Pages. Requires: 4MB RAM, 4MB hard disk space, Microsoft Windows 3.1 or later or Windows 95. Prodigy Services Co., White Plains, NY. *(No Indian partner.)*

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Archistrat 4s

Continued from page 20

grade craze would catch on. Although Compaq did deliver a few CPU upgrade boards, ultimately the high cost and limited options for upgrades killed the concept.

bus. Four of the PCI slots ride on a secondary PCI bus, resulting in decreased performance. More to the point, PCI is the assumed I/O bus for all Archistrat 4s upgrades for the foreseeable future, so regardless of how you upgrade the system, the PCI

ries two serial ports, one parallel port, and mouse, keyboard, and video connectors.

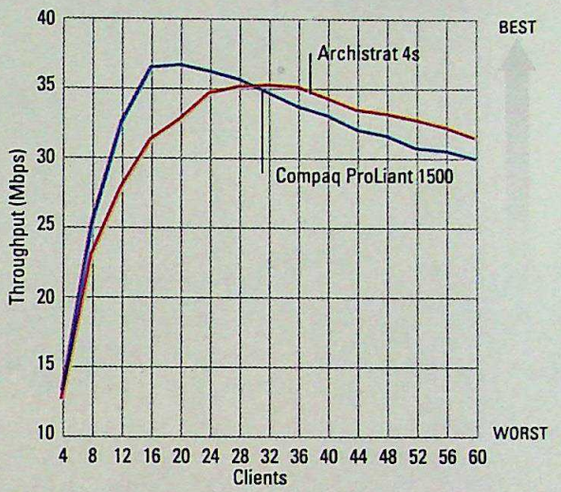
There is also an Adaptec 7870 SCSI interface card connected to the Archistrat 4s's removable storage devices, which are concealed behind a motorized front panel.

BENCHMARK TESTS

Archistrat 4s

On our test suite, NetBench 4.0, the Archistrat 4s was competitive with the fastest servers in our roundup of March 26, 1996. The Compaq ProLiant 1500 5/133 exhibited the best peak performance, but as the workload increased beyond 32 clients, the Archistrat 4s had greater throughput, with a peak of 35 Mbps.

We measured performance under Microsoft Windows NT Server 3.51. Each server was connected to a 60-node network using Fast Ethernet 100Base-TX. Both systems had 128MB of RAM and 512K of external cache. The Archistrat 4s and ProLiant had Pentium/166 and Pentium/133 CPUs, respectively. The Archistrat 4s's five 2GB Fast/Wide SCSI hard disks were configured using a RAID 5 array and Mylex DAC960PD controller, while the ProLiant's four 2GB Fast/Wide hard disks were striped (RAID 0) into one logical volume.



The Archistrat 4s breaks new ground with a novel connector technology called Compass. The connector for all system components on the Archistrat 4s's passive backplane, Compass has 132 contacts per inch. The processor, chip set, and memory all piggyback on the 256-bit-wide Compass bus, which is connected to six 64-bit PCI and six ISA slots.

Thanks to Compass, the Archistrat 4s is the first server we've seen that can switch from an Intel *x*86 CPU to a Digital Alpha by just swapping a board. That is, if Panda Project engineers deliver on their promise of a working Alpha board.

Although the Compass connector is keyed so that you can't put a board in backward, we did damage the connector on a memory board while trying to reinstall the board. An engineering fix is promised to reduce the likelihood of such an event.

Another unique feature of the Archistrat 4s is that it's the first server to use a 64-bit PCI pieces remain in place.

The Archistrat 4s we received for evaluation came with a 133-MHz Pentium CPU, but we immediately upgraded it to a Pentium/166 by swapping the CPU and bridge board, which contains the logic chip set. Indeed, we found this process effortless.

DECISION MAKERS READ PC MAGAZINE INDIA

In part because of cost concerns and also because future CPUs may run at speeds in excess of 300 MHz, the Archistrat 4s has only an FCC class A certification. This is fine for the application-server market but will exclude the unit from certain government installations, which require the more stringent class B certification.

Once you get beyond the connectors, the technology employed by the Archistrat 4s is straight out of the Intel parts book. The 166-MHz Pentium CPU, 512K of external cache, and Neptune chip set on the bridge board formed the core of our review unit. The bridge board also carPress a button on the top of the server and the panel pops out and down in front of the case. Press the button again and the door rises and slides back into place, giving the server a clean, sleek look.

Inside, the drive bays are arranged like the steps on a staircase and are occupied by a 3.5-inch floppy disk drive, a 4X CD-ROM drive, and a 4GB 4-mm SCSI tape drive. An empty half-height 5.25-inch drive bay could house a boot hard disk.

There's room inside for an additional 10 or 12 hard disks, which can run off an optional PCI-based RAID controller. Our test unit came configured with the Mylex DAC960PD controller with 4MB of disk cache and five Fast/Wide SCSI Seagate Barracuda 2GB hard disks. The test system contained two Cogent 100Base-T Ethernet network interface adapters, which were also attached to the PCI bus.

FORM VS. FUNCTION

The Archistrat 4s performed on a par with the best systems from our recent file-server roundup ("Server Power," March 26, 1996) running Windows NT 3.51. On our tests, the Archistrat 4s initially lagged behind the Pentium/133-based Compaq ProLiant 1500 5/133 but eventually overtook it at a client load of 32 workstations.

In view of the fact that it offered only marginal performance gains and slightly more data storage space over the $17,599 ProLiant, the Archistrat 4s seems expensive, especially when you compare the features of the two systems. The ProLiant has hot-swappable drives, predictive hard-disk failure analysis, SmartStart setup and management software, and a rack-mounting option—all features that are not offered on the Archistrat 4s.

If your servers have high visibility, though, the Archistrat 4s has the physical appearance and eye-catching appeal of R2-D2. And it comes in a full palette of colors, from so-called Panda-white-and-cappuccino to black, ruby, sapphire, teal, and terracotta. In this respect, the Archistrat 4s seems to be based as much on form as on function.

Panda Project officials claim the primary reason for buying an Archistrat 4s is not for peak performance but for the ability to keep your system at the optimal performance level the market has to offer over the lifetime of the computer. To that end, they have arranged special lease deals with automatic upgrades.

If the objective of the Archistrat 4s was to deliver a file server whose CPU and chip-set components could be easily upgraded, then this server has unquestionably hit its mark, especially if Panda can provide the Digital Alpha and quad Pentium Pro processor boards. As a showcase for Compass technology, the Archistrat 4s is also a success. As an enterprise server, it is still a few pieces short.

Archistrat 4s. List price: With Pentium/166 CPU, 512K external cache, 128MB RAM, five 2GB Fast/Wide SCSI hard disks, 4-mm SCSI tape drive, 4X CD-ROM drive, $27,000. Panda Project, Boca Raton, FL.
(No Indian partner.)

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KEYBOARDS

Compaq's Scanner Keyboard Integrates Words and Images

By Melissa J. Perenson

You'd like to get a page scanner but lack the desktop space; where, you wonder, can you put another peripheral? Compaq Computer Corp.'s $349 Compaq Scanner Keyboard is a one-stop desktop solution that integrates a sheet-fed page scanner into the upper extremity of a standard-issue Windows 95 keyboard.

Though large by keyboard standards, the Scanner Keyboard is surprisingly compact in view of all that it contains. Compaq uses the same mechanism that is used on Visioneer's popular PaperPort Vx scanner (First Looks, January 9, 1996). The Scanner Keyboard also utilizes Visioneer's PaperPort software as a desktop interface.

Although considered Plug and Play, the setup of the Scanner Keyboard can be quirky. Under Windows 3.1, setup went smoothly by simply connecting the Scanner Keyboard's Y-cable into the two appropriate ports (PS/2 port for the keyboard, serial port for the scanner), turning on the system, installing the software, and then calibrating the scanner with a white sheet of paper. Under Windows 95, you'll have to connect the scanner to the serial port *after* starting up Windows 95 but before installing the software; otherwise, Windows 95 will not detect the presence of the scanner. The Scanner Keyboard does not work under Windows NT.

The Scanner Keyboard produces digital images at anywhere from 200- to 400-dot-per-inch resolution and 256 shades of gray. You select the type of document you're scanning—such as an article, business card, letter, photograph, or snapshot—and the software automatically chooses the most appropriate resolution and bit depth. It took about 4 seconds to scan a letter-size document.

The presence of the scanner significantly enlarges the keyboard's dimensions, particularly in terms of height (3.5 by 3.0 by 12.5 inches). The scanner has two raised bumps that act as paper guides; the maximum paper size is 8.5 by 30 inches, while the minimum size is 2 by 3 inches. The scanner's curved hood routes originals according its positioning. You can have d ments spew out behind your k board in a straight paper path have them curve upward back ward you and the keyboard.

Since you'd pay about the sa price just for the PaperPort alone, the Compaq Scanner K board is a good deal.



NIGHT AND DAY: *These two scans show the difference between scanning a document using the Scanner Keyboard's article setting (right) and the photograph setting (left). Note that the scan on the left is crisper and the photographs are clearly distinguished, but that you also get a grayish overcast when scanning in that mode.*

Compaq Scan Keyboard. E mated str price: $349. Requires: with serial port and PS/2 mo port. Compaq Computer Co Houston, TX.

(Indian subsidiary Compaq Comp Asia, Du Parc Trinity, 17 MG R Bangalore 560 001. Tel: 5596347.)

FINANCIAL SOFTWARE

Financial Analyst: The Textbook Answer to Practical Business Computation

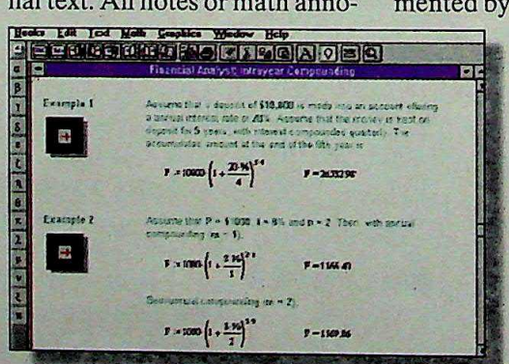
By Mary Paulson

McGraw-Hill's Financial Analyst, a $69.95 electronic version of the company's *Pocket Guide to Business Finance*, makes use of the MathCad engine developed by MathSoft to create an interactive program targeted at small-business owners, executives, managers, and accountants.

The heart of Financial Analyst is the more than 200 built-in calculations and formulas, ranging from simple ratios and cash-flow and profit-margin computations to complex regression analyses and statistical models.

Each of the program's tools is alphabetized, numbered, and cross-referenced for quick referral, and the included worksheets better illustrate the concepts set forth in the *Pocket Guide*. A paperback version of the book is also included with the package.

Another helpful feature of this program is the ability to make notes in the margins, although the program will not allow you to change or delete any of the original text. All notes or math annotations are displayed in a contrasting color so that you can keep track of your modifications.



HIT THE BOOKS: *Financial Analyst brings the math textbook into the 1990s to create a valuable business reference.*

For extended calculations, there's the MathCad Scratchpad. You can also copy, cut, paste, print, and save your changes in the electronic book, though you can't save or print the content your Scratchpad.

An extensive help file is a mented by pop-up help and c text-sensitive h messages. Navigat buttons in the tool make it easy to sea the Table of Conte and the Index or use the hyperl links throughout book to jump fr section to section. Business professio will appreciate simple and inexpen guide to practical c putation.

McGraw-Hill's Financial Analyst price: $69.95. Requires: 4MB R 12MB hard disk space, M soft Windows 3.1 or later. Graw-Hill Inc., New York, *(No Indian partner.)*

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BACKUP

WinSync Backs Up Your Data With Point-and-Click Ease

By Charles Lin

Tired of manually backing up your files to the network file server? Whitehill Technologies can make your life easier with its $59 directory-mirroring and file-archival utility, WinSync. In spite of a few minor quirks, WinSync is an invaluable tool for preserving the integrity of your data.

WinSync uses a "working" directory and a "backup" directory scheme. When copied into the Windows Startup Program Group and running in continuous mode, WinSync monitors your files as you work. The program checks the working directory for files that have been modified since the last synchronization has been done.

WinSync relies on the time stamp of each file to monitor which files have changed. The program then copies the relevant files into the appropriate backup directory.

The user can define the frequency of the backups and expiry times. The use of file-expiry times lets you get rid of old and unwanted files in your directory. By using the combination of expiry time and WinSync's archival function, you can automatically archive your disused files and remove them from your working directory.

If you deleted a file from your working directory, WinSync will label the mirrored file in the backup directory as an "orphan" file. You will then have the option of copying the file back to your working directory, deleting it from the backup directory, or ignoring it.

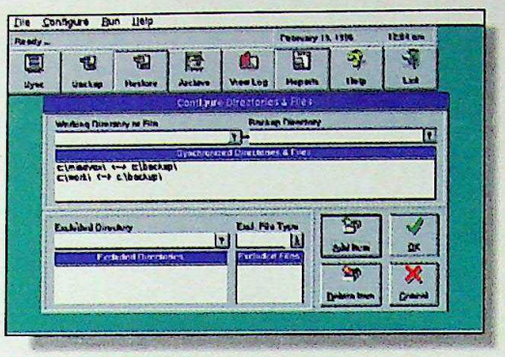
When two working directories are used for the same backup directory, however, WinSync only recognizes the first working directory and labels all the files from the remaining working directories as orphans, regardless of their status. The only solution we could get to work was to create a separate backup directory for every working directory we used, which can be a cumbersome fix.

The key missing element is that WinSync doesn't incorporate file compression. When it archives a file, the actual files can get large fast.

During our evaluation, we also encountered other more minor problems with WinSync. For example, the program was stable on our networked Windows for Workgroups 3.11 test machine. But only after we installed several updated files did WinSync work w with our Windows test system.

WinSync does hav few quirks, but t program makes ba ing up files to the n work a point-an click snap.

WinSync. List pri $59. Requires: 8M RAM, 1MB ha disk space, Micros Windows 3.1 or la or Windows 95. Whitehill Tec nologies Inc., Moncton, N Brunswick, Canada. *(No Indian partner.)*



CLICK AND KEEP: *WinSync lets you choose what to back up with an intuitive interface.*

BACKUP

Arc Solo for Windows 95: Backup for the Masse

By Sal Ricciardi

If you're shopping for a Windows 95 backup solution, put Cheyenne's $149 Arc Solo for Windows 95, Version 1.0, at the top of your list. The product brings an impressive array of backup features to standalone PC users, although our testing indicates that if you use its powerful database features, its performance may be disappointing.

Arc Solo feels right at home in the Windows 95 environment. It uses tabbed dialog boxes and an Explorer-like hierarchy to present your source and destination choices. For example, you can choose My Computer to back up your entire system at once or select individual drives, directories, and files on your PC or a shared network resource.

Backup jobs can be customized in a variety of ways and scheduled for execution at a particular time (such as midnight) or at regular intervals (such as every Saturday). You can even back up a volume directly from Explorer. Just right-click on the drive and choose Backup to start a backup job running in the background.

Where Arc Solo really shines is in its extensive reporting and management options. The program maintains a database of information on all of your backup sessions and then lets you view this information in a variety of useful ways. For example, you can quickly get answers to questions such as "What versions of this file exist on tape?" or "Which tape did I use last?"

You'll have to pay a little in terms of performance for this convenience, but we found the cost more than worthwhile. If speed is of the essence, you can easily d able Arc Solo's database if y want to trade this level of detail information for faster operatio

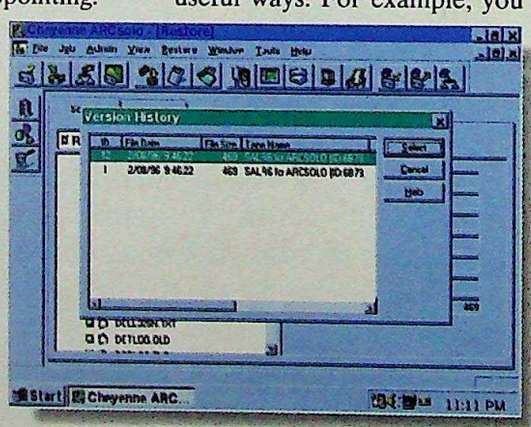
Arc Solo's disk-based recove utility lets you restore your sy tem from tape without having reinstall the operating system. W tested this feature and after su fering some setbacks because missing documentation, we fou it worked as intended—alb slowly.

During testing, the most n ticeable absence was support f anything other than a SCSI d vice. By the time you read th Cheyenne will have added su port for QIC/Travan device parallel-port devices, and remo able media such as floppy disk magneto-optical disks, or Z disks to its existing support f SCSI devices.

If you're interested in protec ing your data, look no furth than Arc Solo.

Arc Solo for Windows 95, Version List price: $149; upgrade, $19.9 Requires: 8MB RAM, 12MB ha disk space, Microsoft Windows supported SCSItape drive a adapter. Cheyenne Software In Roslyn Heights, NY.

(Indian partner Onward Technologies, Kri House, Saki Vihar Road, Saki Naka, Bom 400 072. Tel: 8362097; Fax: 8364180.)



WHERE'S THAT FILE? *Arc Solo for Windows 95 maintains a database of backup information, making it easy to track your tape library.*

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Shree Lipi : Shree Lipi is an Indian Language script processor under MS Windows, with a collection of fonts and utilities compatible with both **IBM PC and Macintosh**. The ultimate in desktop publishing, it supports the largest collection of Indian typefaces in all Indian scripts and has a variety of keyboard layouts.

Shabda Sagar : Shabda Sagar is a DOS based **multilingual word processor** with commands that are similar to Word Star. User friendly to the core, it supports a majority of printers in use. Another attractive option is the availability of a variety of keyboard layouts.

Shree Lekha : Shree Lekha is a DOS based Indian language script processor available with **fonts for multimedia** video graphics. Its diverse features support various applications including Autodesk Animator & 3D Studio etc.

Prateek Pro : A software package for preparing General Purpose Identity cards in Indian Languages, its applications can include Labels, Tags etc also. The package includes a simple data base editor, along with an image grabbing module, flexible layout designing & printing module for use in both B/W & colour photographs as well as text.

Multikeys : Multikeys is a DOS based keyboard layout handler for Indian Languages to be used with GIST cards. It allows the use of popular keyboard layouts like Modular, Godrej, Ramington etc. Also available is a program for generating user defined layouts.

For more details contact :

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INTEGRATED SOFTWARE

PerfectWorks 3 Adds Tight Integration and Links to the Online World

By Da id Haskin

Rather than follow the market leader, Microsoft Works, Novell's $79 PerfectWorks 3 blazes its own trail with a feature set and a level of connectivity and integration that Works can't match.

PerfectWorks' core word processing, spreadsheet, and database modules match and sometimes surpass those of Works (First Looks, October 10, 1995) and ClarisWorks (First Looks, March 26, 1996). Unlike Works, PerfectWorks includes a grammar checker and QuickCorrect, which fixes spelling errors on the fly.

The word processing module in PerfectWorks supports basic capabilities such as bullets, columns, footers, and headers. You can even create chapters with individual page numbering, footers, and headers.

STYLE-CONSCIOUS

Like Works and ClarisWorks, PerfectWorks' word processor and spreadsheet support styles for quickly establishing a document's format. The spreadsheet has 100 built-in functions, significantly more than those found in Works. PerfectWorks has an auto-sum icon for adding rows or columns, although automatically completing a data series requires a trip to the menus. PerfectWorks provides 84 chart types and extensive formatting options, including the ability to alter the depth and angles of 3-D charts.

The flat-file database is the program's least powerful module but is quite simple to use. It supports seven types of fields, and the well-designed and self-evident dialog boxes make things such as field verification easy.

The missing link is that PerfectWorks has no report generator. The closest you can come is adding a summary field to a database, such as an average, count, or sum, before printing out records.

Beyond its core modules, PerfectWorks includes drawing and paint applications that are notable because they include special effects such as mosaic, drip, and color stereogram effects. There's also a version of Quicken, which provides basic checkbook management capabilities but no investment or budgeting tools.

Although its modules are strong, PerfectWorks' integration and connectivity capabilities are what really sets it apart. It has direct links to the Windows 95 dialer so that you can dial a number from any module. It also can send messages via numeric and alphanumeric pagers.

Its Caller ID module, which loads separately from PerfectWorks, displays the name and phone number of all incoming callers. You can set the Caller ID module to notify you automatically on receipt of a call via a MAPI-compliant e-mail system or your pager.

Unfortunately, the Caller ID module can't use the incoming telephone number to display the caller's database record automatically, and the Caller ID module insists on playing a .WAV file when the phone rings. Although you can't shut this feature off, you can force it to play a blank .WAV file.

During installation, PerfectWorks scans your system for America Online (AOL), CompuServe, Microsoft Internet Explorer, The Microsoft Network, and Netscape Navigator. After examining those applications, it places recently or commonly accessed online resources in a tab in the QuickStart dialog box, which appears when you start PerfectWorks or select New from the File menu.

You can jump to a resource by selecting it from that tab. Perf Works includes the front en AOL, which you can launch f the same tab. Despite all this nectivity, however, PerfectW doesn't have its own commu tions module, as does Micro Works. As with C Works, you have rely on Windows communicati utility, HyperTerm The integration tween modules is t powerful and sim You can add one of information, s as a drawing, into other, such as spreadsheet, by ing a button and ging a window ac the host docum When you double-click on embedded object, the menus toolbar change to reflect thos the embedded module.

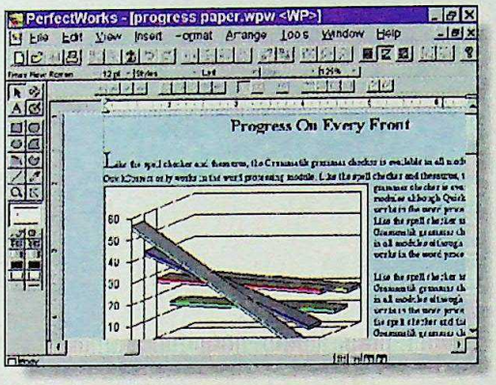
More streamlined than O 2.0, PerfectWorks' proprie technology requires only i clicking and mouse-dragging stead of sifting through mul layers of menus. If you want t tegrate a file created by an ex nal application, PerfectW supports OLE 2.0.

WIZARD-FREE

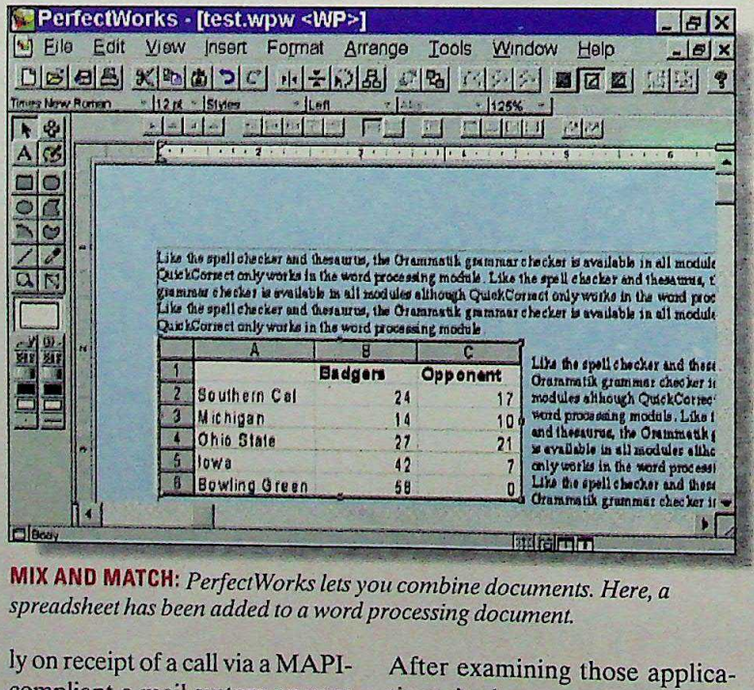
PerfectWorks lacks the auto ed simplicity of wizards, wh Microsoft elevated to an art f in Works. PerfectWorks pa makes up for this shortcom with QuickAdvice, which fo vides step-by-step instruction basic chores.

PerfectWorks' lack of wiz and a report writer are ill-adv in a product aimed at small-b ness and home users. Bey those shortcomings, tho PerfectWorks is unusually p erful for integrated software a simple, consistent interface provides excellent integra and connectivity capabilities **PerfectWorks 3.** List price: Requires: 8MB RAM, 8MB disk space, Microsoft Win 95. Novell Inc., Orem, UT.

(Indian partner Onward Novell, Bom 072. Tel. 8214982, 8214981; Fax : 82



VISUAL APPEAL: *From the spreadsheet, you can easily add one of the 84 chart types included in PerfectWorks.*



MIX AND MATCH: *PerfectWorks lets you combine documents. Here, a spreadsheet has been added to a word processing document.*

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First Looks
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ENTIUM NOTEBOOK

igital Launches Pentium-Based HiNote Range

angalore-based Digital India has announced a complete new Digital HiNote line—a ntium family of aggressively iced, high-performance otebook computers. The iNote family's full line up cludes several network-ady features and Intel's cently announced 100 Hz and 133 MHz ntium mobile microprossors.

Models range from the iNote Ultra II high-end ortables that deliver adanced features and maxium portability with the dustry's thinnest, lightest otebook design—and the w HiNote VP, a modular ne of entry-level notebooks at deliver optimum price/ rformance with high-end atures and aggressive icing. The new family also inudes the industry's first fully tegrated Windows NT notebook configurations, and each member of the HiNote family is Windows NT certified.

The new HiNote notebooks are Digital's first mobile products to include Digital ClientWORKS software as a standard feature. ClientWORKS is a powerful combination of preloaded client management and networking utilities that help network administrators get the most out of their networking environments.



HiNote Ultra II: *Digital's answer to the potential of the Pentium-based mobile PC.*

Both the HiNote Ultra II and HiNote VP lines feature a port replicator with an optional Ethernet interface to facilitate instant network connection. The optional port replicators allow for quick and easy connectivity to office-related peripherals and accessories, making the HiNote family ideal mobile solutions for networked environments.

The Digital HiNote Ultra II maintains Digital's notebook leadership in lightweight, elegant design, providing mobile professionals with the thinnest and lightest full-function Pentium notebooks in the market. The HiNote Ultra II ships with either a 100, 120 or 133MHz Intel Pentium processor and includes external catche memory and accelerated graphics to provide increased system performance. All models feature a 10.4" SVGA active-matrix color display.

The expandable design of the HiNote Ultra II supports up to 40 MB of system memory, and includes a removable hard disk drive that ranges from 1.08 GB to 1.35 GB of storage. The new system maintains compatibility with existing HiNote Ultra expansion options, including the popular Mobile Media module that transforms the HiNote Ultra into a portable multimedia notebook with three-speaker stereo sound and a quad-speed CD-ROM drive, significantly smaller than many non-multimedia notebooks on the market.

HiNote. *Digital Equipment India, Digital Park, 92 Industrial Suburb, II Stage Yeshwanthpur, Bangalore 560002. Tel: 3374785; Fax: 3374601.*

NTERNET ADE

un Microsystems Launches ava Development Environment

S-based Sun Microsystems, a $ 6 billion company specializing in products and serices for open network computg environments, has introduced unSoft Internet Workshop, a omplete development environent for building universal clint and network server applicaons for enterprisewide deployent. SunSoft Internet Workhop includes Java Workshop or universal client development, nd SunSoft Visual Workshop nd NEO development tools for calable server development. NEO is the company's distributd object application environnent. The software can be used o develop complete zero-admintration applications for any cli-nt, and create scalable, manageable n-tier server applications.

Java Workshop is being touted as the first complete Java development environment in the international market. Java Workshop is written exclusively in the Java language. Currently available for Solaris 2.4, Windows NT 3.5.1, and Windows 95 operating systems, Java Workshop can be used by developers to design, test, deploy, and maintain Java applications. Its features include an intuitive Web browser-based interface that expands the developer's environment to encompass the Web; an integrated editor, compiler, and debugger; an innovative Web component repository for reuse; and multi-platform support to enable development and deployment on the platform of the user's choice. The software will be available from September 1996.

SunSoft Internet Workshop. *Tata Consultancy Services, Air India Building, Nariman Point, Bombay 400021. Tel: 2873413; Fax: 2040711*

PROCESS MANAGEMENT TOOL

Enexco Launches Pager-Based Plant & Process Monitoring System

Secunderbad-based Enexco Technologies has developed MobiCom, a mobile on-line alarm paging system that operates directly through the pager of the site personnel.

MobiCom is the latest generation of process management tools to monitor and supervise plant and process, without being glued to the control desk. The system transmits alarms and process information to the right person on time. MobiCom interfaces with most of the popular process control systems. Plant and process information, alarms, and events are informed to the concerned managers/engineers/technicians wherever they may be located, on their alphanumeric pagers.

The system categorizes users into groups or departments and information is sent only to the relevant group personnel. The system handles multiple people having different work schedules. Alarms are transmitted only to the personnel on duty, depending on the work schedule and the department they are in.

MobiCom can handle up to 1,000 pagers on one system with group calls and a provision for both numeric and alpha-numeric massaging.

Enexco Technologies is a specialized process automation company catering to the Indian industry since 1985. It has been involved in the development of expert systems, real-time process control and optimization, thermal imaging, client-server architecture, and business applications.

MobiCom. *Enexco Teknologies India, #6 Raghava Housing Society, Venture II, Transport India, Secunderabad 500009. Ph: 810173; Fax: 812334.*

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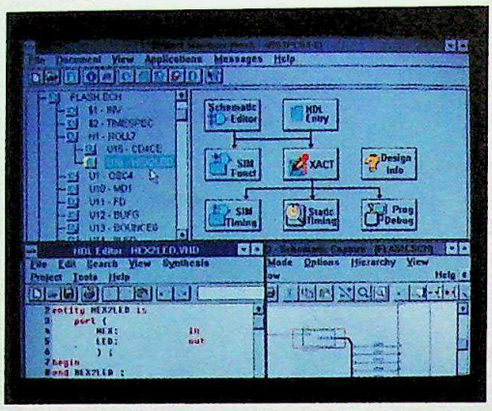
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DESIGN TOOL

Xilinx Launches Windows-Based Tools for Standard CPLD/FPGA Design

California-based Xilinx has introduced the Xilinx Foundation series, a fully integrated set of software solutions that support a broad range of CPLD and FPGA design requirements.

The Windows-based software provides access to industry standard Hardware Description Languages (HDLs), synthesis, schematic entry, gate level simulation, and the Xilinx XACTstep implementation tools. The Xilinx Foundation series allows users to shorten design cycles and the learning curve associated with designing, using industry-standard HDLs.



Xilinx Foundation Series: *Integrated solutions that support CPLD/FPGA design requirements.*

Since Xilinx Foundation tools are integrated into a common design management environment, users have access to all technology from design entry to implementation and verification. As a result, the new series provides ease and flexibility when designing with industry standard languages. For example, an integrated, push button HDL editor provides the user immediate HDL assistance during mixed design entry.

Xilinx Foundation software has a number of different features, including HDL Wizard, VHDL Synthesis, and ABEL-HDL Design. These features free designers from restrictive proprietary architectures, offering them the ability to do CPLD and FPGA design in a standards-compliant, technology-independent environment.

HDL Wizard makes language-based design easy and efficient in both VHDL and ABEL-HDL. It includes an HDL editor with built-in intelligence for learning HDL, language templates for cutting and pasting common HDL functions, and color coding of HDL key words for leading the user through the text entry process.

VHDL Synthesis provides a simple, low-cost tool for synthesizing VHDL text files, and supports fully compliant IEEE 1076 code. Proven compile times show a designer can synthesize a 2,000-3,000 gate design in two minutes. Design files are non-proprietary, technology-independent, and synopsis-compatible. As a result, designs created VHDL can be reused even target device changes.

ABEL-HDL Design vides easy migration from designs to higher density CPLDs and FPGAs. It inc push button design flow hierarchical design entry JEDEC file conversion, ena reuse of existing PAL cod fitter architecture with aut ic device selection allow signers to focus on design tionality.

The Xilinx Foundation ware solutions are available on PC platforms run Microsoft Windows 3.1, rate versions for Microsoft dows 95 and Windows NT forms will be announced this year.

Xilinx Foundation. *Xilinx Pacific, Unit No. 2308- Tower 1, Metroplaza, Hing Road, Kwaj Fong, NT, Kong. Tel: 852 2410-2739, 852 2494-7159.*

JUKEBOX

MDI Introduces Large Capacity Optical Jukeboxes for Archival Applications

US-based Micro Design International has introduced two new large-capacity optical jukeboxes—the SCSI Express Library 166MXT and the SCSI Express Library (SEL) 309MXT. With capacities of 166 GB and 309 GB, these giants provide immediate access to a data-warehouse—ideal for archival and document imaging applications. These jukeboxes use a dual transport mechanism allowing two optical disks to be moved at the same time. This equals a disk exchange time of only six seconds, a 40% speed improvement over traditional single picker jukeboxes.

SEL166MXT uses four high-speed multi-function drives to read and store up to 166 GB of information on 1.3 GB 128 optical cartridges. SEL309MXT uses six drives to read and store up to 309 GB of information on 1.3 GB 238 optical cartridges. Independent drives mean fewer disk swaps and more data under the head. These multifunction drives detect the formatting on the industry-standard 5.25-inch optical disks and automatically enter the appropriate rewritable or write-once mode. A conversion kit will be available to upgrade SEL309MXT to next-generation 2.6 GB drives.

SEL166MXT and SEL309MXT are supported by SCSI Express 2.5 for Novell, which provides transparent access to optical cartridges as NetWare volumes. SCSI Express is a proven solution for optical jukeboxes in the Novell environment. The combination of SCSI Express software and this new dual-transport robotics mechanism provides an unsurpassed storage solution combining speed and capacity. SCSI Express provides transparent access off the Novell file server and permits expanded access to those clients connected to the server by supporting name space including DOS, OS/2, Macintosh, and NFS. MDI also offers complementing software, including LAN Librarian for backup and archival requirement, and EZ Express, MDI's alternative to HSM solutions. EZ Express provides automated migration and direct access to archived data.



MD's Optical Drive Range: *Safe for long-term data and information storage.*

SEL166MXT
SEL309MXT are the most able optical jukeboxes avai with no preventive mainte required. The drive has an M of 100,000 hours and 1,00 swaps. The MTBF for autochanger robotics is 60 hours and 2,000,000 swap drive ever needs replacem can be exchanged while th er drives continue to rea write.

Micro Design Interna is a mass-storage solution vider delivering hardwar software designed for today idly changing marketplace is represented in India by Delhi-based Imaging Solu which is the sole distributo service agent for MDI pr in India.

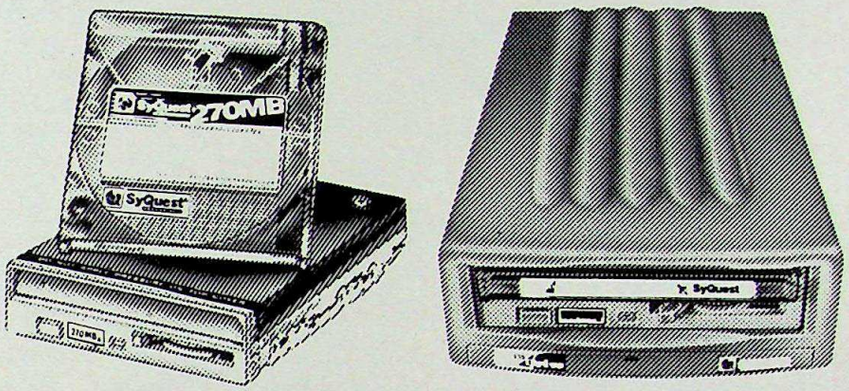
SEL166/309MXT. *In Solutions, No.2 Nidhi Hous 1B, Safdarjung Enclave, Delhi 110029. Tel: 688 678932.*

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Good News for IT users in Banking, Finance, Corporate/SOHO, R&D, Defence, Multimedia, Education, Advertising, Publishing....

Imagine what you can do with a Hard Disk Drive that's removable, portable, has infinite storage capacity and guarantees 100% data security!



THE SYQUEST REMOVABLE DISK DRIVE.

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For those who value speed, efficiency, portability, reliability, and data security for data processing, SyQuest presents the ultimate data storage system : The Removable Cartridge Hard Disk from SyQuest, the world leaders.

SyQuest employs reliable **Winchester technology** for **high speed** and **performance** even when backing up data. Because SyQuest cartridge disks are **removable**, your **data is portable** and **highly secure.**

What's more, you can **upgrade your disk capacity** by simply **adding SyQuest disk cartridges instead of expensive hard disk drives**, making your system extremely **economical** and maximizing its potential.

In fact, SyQuest drives are **2-3 times faster than Magneto Opticals**, making them a better, faster, safer and portable alternative to conventional storage media for multiple platforms like **PC, Apple MAC, SUN, HP, Silicon Graphics, AMIGA, Music Samplers, etc.**

PRODUCT RANGE

- **100 MB 1.8"** PCMCIA Type III & Stacked Type II drives for Mobile Computing.
- **EZ 135 MB 3.5"** IDE Internal and SCSI/Parallel External Drives.
- **200 MB 5.25"** SCSI Internal and External Drives.
- **270 MB 3.5"** IDE/SCSI Internal and External Drives.
- **1.3 GB 3.5"** Drives.
- **100 MB - 1.3 GB** Disk Cartridges.

Fastest Removable Drive : The SyQuest EZ 135 MB is the Fastest Removable Cartridge Hard Disk Drive yet. Iomega's Zip drive is slow by comparison, primarily because of slowest access times to data.

COMPARE THE BENEFITS

	SyQuest EZ 135	ZIP 100
SEEK TIME	13.5 MS	29 MS
DTR	2.4 MB/SEC.	1.24 MB/SEC.
WARRANTY	2 YRS ON DRIVE 5 YRS ON MEDIA	1 YEAR
PARTITIONS	26	NIL
MEDIA LIFE	30 YRS.	10 YRS.

DTR = DATA TRANSFER RATE

(Source : MACWORLD Dec '95 / PC Magazine Mar '96)

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BROUTER

D-Link's Remote Ethernet Brouter

Bombay-based D-Link India has announced the availability of its DI-1135 Ethernet bridge-cum router for internetworking. Designed to get internetworks up and running fast, DI-1135 eliminates unnecessary call charges by automatically sensing when traffic has ceased, and terminating the ISDN connection while 'spoofing' the services offered by the server, thus still appearing connected. When access to the network service is required again, DI-1135 automatically and transparently re-establishes and updates the connection. In additon, it features powerful Bandwidth On Demand (BONDing) to ensure efficient throughput and to provide businesses with long-term cost savings. The optional data compression module boosts throughput rates by up to 600%.

With a menu-based interface, SNMP MIB II and TELNET, management and configuration is simple. Control of individual link activation can be based on time of day, IP and/or IPX destination address, while 2nd link activation based on bandwidth use and automatic dial-up link recovery is also included.

DI-1135 meets strict security requirements by providing filtering based on protocol, address, and on any information in the Ethernet frame.

Several DI-1135s can be linked together in a point-to-point topology using the standard backup link for disaster recovery, or with a second active link operating in load share mode. DI-1135s can also be linked together in a multi-point topology, connecting three or more remote LANs. Its unique closed WAN loop feature allows all sites to be interconnected for optimal traffic flow. DI-1135 is available in a variety of configurations—for ISDN, leased-line or frame relay, for 10Base5, 10Base2 or 10BaseT, with or without compression, and for IP routing or combined IP & IPX routing.

D-Link India is a subsidiary of Taiwan-based D-Link Corporation, which has a strong international presence in over 70 countries worldwide. D-Link is dedicated to the development, manufacturing and marketing of corporate networking products for workgroup and departmental applications.

DI-1135 Ethernet Brouter. *D-Link (India), Plot No. 5, Kurla Bandra Complex, Off CST Road, Santacruz (E), Bombay 400098. Tel: 6112788; Fax: 6172476.*

NUMEROLOGY

Delhi Firm Launches Prediction Pac

Delhi-based Computer Masters has come up with a new package to predict day-to-day events & other hot items like race, speculation, lottery number, share market, and so on. This complete commercial package suggests remedies through charity, stones and *yantras*.

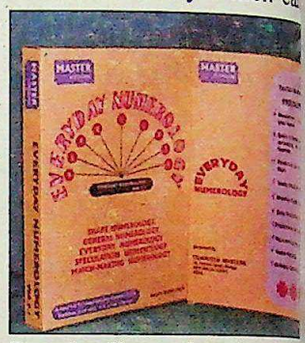
This is the first time that an Indian software company, after intensive research, has been able to develop a numerological software based on the famous Cherio theory of numerology and Hindu astrology. The package, called Everyday Numerology, is based on MS-DOS.

Everyday Numerology verifies whether your name comes in good numbers or bad numbers, and gives the user two chances to change or modify the name. It compares the user's name with his/her birth number—whether the name is favorable, unfavorable or neutral according to the birth number. It predicts the user's lucky number according to his name.

Other functionalities of the package include basic predictions of birth number, general predictions of birth number, predictions as per sun sign based on Hindu astrology, yearly predictions for any desired number of years, monthly predictions, daily predictions.

Daily prediction number be used as race numbers, lo numbers and for speculatio the share market. This pac also includes a facility for ma making, which is based on date of birth of boy and girl

Everyday Numerology h database facility which ca



Everyday Numerology: *Predicti future through numerology*

used to store client predic details.

Minimum system requ ments for the package inc PC 286 and above, DOS 3.3 above, 2 MB RAM, 2 MB space in hard disk, and a 80 column dot-matrix printer.

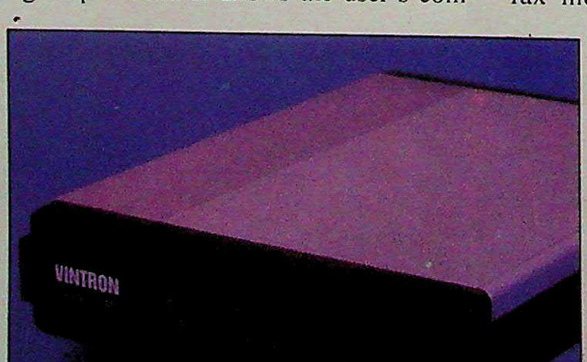
Everyday Numerology. *C puter Masters, 39 Central Ro Bhogal, New Delhi 110014. 4641343; Fax: 4641343.*

MODEM

Vintron Launches 14,400 bps External Data/Fax Modem with Sound

New Delhi-based Vintron Electronics, a member of the Vintron Ritcomp group which specializes in PCs, PC sub-assemblies, and peripherals, has launched an external 14.4 Kbps data/fax modem supporting voice communication. The modem is based on the V.32 bis standard.

The Vintron modem is a direct connect desktop device. It supports a fall-back/fall forward feature which allows the device to match on-line speeds to ensure reliable communication with any other fax/data modem. It allows the user's computer to connect with virtually all standard fax machines and fax modems worldwide. The MNP 2-4/V.32 feature guarantees clean data transmission and maximum reliability. MNP5/V.32 bis boosts data throughput to 57,600 bps.



Vintron's 14,400 bps Modem: *Hayes-compatible modem for home and office applications.*

The principal features of the modem include support for V.32 bis, V.32, V.22, BELL 212A, and BELL 103 standards. It can send and receive Group III faxes supporting V.17, V.29, V.27 ter, V.21 standards. It has a set of 9 status indicators on the f panel. Operations supported clude auto-dial and auto-ans storage of one-user config tion and four 36-digit dial str tone and pulse dialing, auto ic speed buffering, call prog monitoring, and call back s rity with password checkin has an extended Hayes AT c mand set, and works with p lar communication software

The addition of the mo will enhance Vintron's pr range.

14,400 bps modem. *Vi Electronics, F-34 Okhla I trial Area Phase I, New D 110020. Tel: 6814520; 6810460.*

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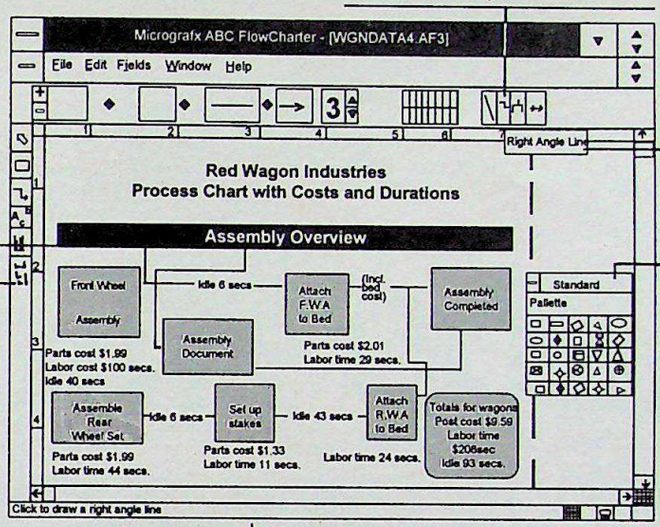
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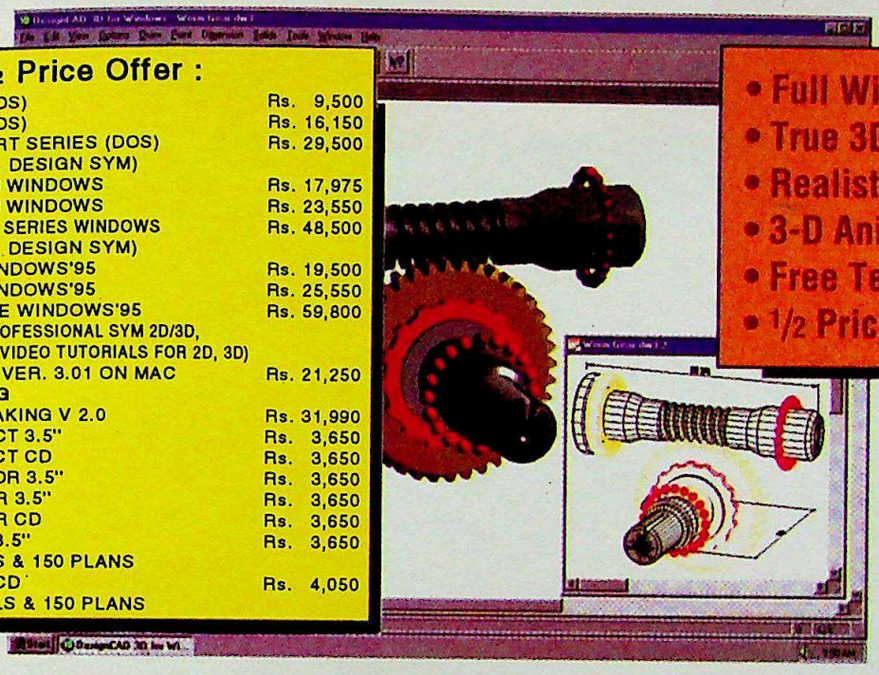
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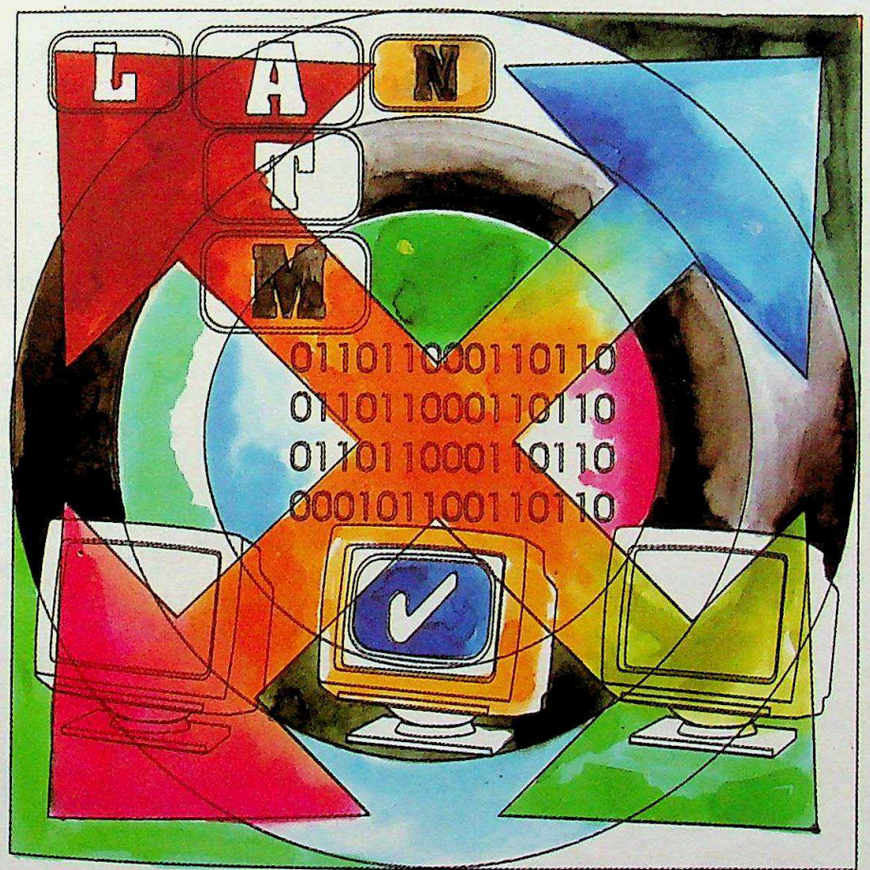
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Cover Story

ASYNCHRONOUS TRANSFER MODE

ATM on the Move

The products are here, but their performance may not be what you expect. Like all technologies, this one carries trade-offs.



By Robert P. Lipschutz

It's game day for asynchronous transfer mode—you know, ATM. Forget about the potential, the predictions, the probable. It's time to look at some shipping products. That's what we did, and we got a healthy dose of reality as we tested five vendors' high-speed ATM adapters at PC Magazine Labs, West Coast. It was enough to make us say that you'll need to think carefully

INSIDE

PC MAGAZINE

We're just like you. We couldn't wait for ATM to get here either. We've wanted to get our hands on a bunch of shipping ATM products for a long time and put them into a comparative review. The results? Read on.

ROB LIPSCHUTZ, OUR TECH director for networking, headed up this coverage out at PC Magazine Labs, West Coast. Lipschutz and his team observed some encouraging interoperability among these adapters, but we also watched as each of these ATM 155-Mbps cards turned in performance no better than 20 to 30 Mbps when they had to deal with LAN Emulation. You pay a big price in overhead, it turns out.

ALSO, CHECK OUT THE FIRST LOOKS section that staff editor Sarah Roberts put together. First up are reviews of three Web-server packages. Lipschutz and author Ryan Tabibian review versions that work on Windows NT: The Internet Factory's Commerce Builder, Microsoft Internet Information Server, and Spry SafetyWeb Server. "SSL and ODBC" is the battle cry here.

NEXT, TECH ANALYST RUSS Iwanchuk reviews an innovative network management suite from Madge Networks called SMONMaster. This program allows simultaneous high-level RMON views of Ethernet, Fast Ethernet, FDDI, and Token-Ring traffic. Now you'll need to be running a Madge or LANNET switch, says Iwanchuk, but the payoffs are big. It's not inexpensive, only invaluable.

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about whether ATM products make sense for your network today or whether you should wait a while.

We asked companies to send us their PCI 155-Mbps SONET adapters with LAN Emulation software for use with Microsoft Windows NT and, optionally, with NetWare 4.1. Five companies met the challenge with shipping products—Adaptec, Fore Systems, Interphase Corp., Olicom USA, and ZeitNet.

Like many high-speed networking solutions, ATM products can help you redesign your network, fix a performance problem area, or add bandwidth for a specific application. But like most nascent product groups, this one carries some interesting trade-offs. Surprisingly, we could coax only 20 to 30 Mbps of throughput out of these adapters using LAN Emulation under Microsoft Windows NT. (See our performance test results for more details.)

Some companies you might expect to see here did not make it in for various reasons. Digital Equipment Corp. got us an adapter, but a team from our Labs and Digital's technical support could not coax it to work with our desktop computers. IBM and Madge are both concentrating on 25-Mbps ATM and chose not to participate in this review of 155-Mbps adapters. Efficient Systems did not have a PCI adapter at this time, and Newbridge Networks Corp. did not submit any adapters for our review.

ATM: ALL THE MUSS

Much of the attention surrounding ATM is due to its ability to handle network data traffic right alongside time-sensitive video and voice streams. You can't do this as effectively with Ethernet or Token-Ring. But in reality, ATM today doesn't provide any such solution for integrated data, voice, and video networks because there is no method for such applications to talk to the ATM network effectively.

> ATM has two big things going for it: It works at extremely high bandwidths, and its switching architecture is better for managing bandwidth.

Most people who will buy ATM today will do so because it is on the path to the ideal network. It also provides some measurable improvements in data-only networks. Even bigger benefits will come later, when applications that use data, video, and voice start talking with the ATM network and are able to tell the network specifically what they require.

This new high-speed solution will find its way into networks both as a local ATM backbone and a workgroup solution. It works well, for example, for connecting a number of LAN segments, for high-speed server connections, or for connecting desktops and servers to high-speed ATM workgroups.

Among its many appeals, ATM has two things going for it: It can work at extremely high bandwidths (622 Mbps), and its fundamental switched architecture is better than existing technologies for managing network bandwidth.

No matter what the technology, the challenge is to make the best use of bandwidth. One way to do this is to add bigger pipes, as you have been able to do for some time with Fast Ethernet and 100VG- AnyLAN. Another way is to manage the bandwidth more intelligently, as in switched Ethernet.

ATM improves on both approaches. It provides a choice of high-speed options ranging from 25-Mbps and 155-Mbps (SONET) adapters to 622-Mbps modules for ATM switches. And it has better bandwidth management than switched Ethernet or 100VG-AnyLAN. ATM uses virtual circuits to manage bandwidth allocation, and it can use multiple emulated LANs to segment traffic better. Although today there are no widely available methods for users and applications to talk directly to ATM, network administrators can use logical network assignments to give users and networks more bandwidth.

The 155-Mbps PCI adapters we tested form the fastest-growing segment in the ATM market. We tested these adapters using Pentium-class desktop and server PCs running Windows NT and NetWare using LAN Emulation, Version 1.0. We were surprised to find that we didn't see the high performance we expected from these adapters. Further testing showed us why: Today's networks are not yet ready for the high speeds of ATM.

We were pleasantly surprised, though, by the results of our interoperability testing. Adapters from different companies worked together! In the world of networking, that's pretty good for a technology that's just coming to market.

As with any network adapter, the features of these ATM adapters break down conveniently into a combination of hardware and software items. But with ATM the software is more important. Remember that in today's Ethernet networks, it's

RapidFire ATM PCI 155 Adapter

Although each of these five ATM adapters carries features that could recommend it, Olicom's entry was the most polished and complete of all.

For starters, this adapter's installation went the smoothest—we installed it right out of the box with no problem. This was no small matter. We ran into extra steps or other issues with each of the other adapters. We grant that this may be expected with the first shipping products to implement a new technology. But that's what made Olicom's adapter stand out.

In addition, Olicom included driver software with the RapidFire: NetWare 3.*x* and 4.*x*, Windows 95, and Windows for Workgroups. No other card here covered us for that breadth of OSs. And Olicom's was the only adapter to include a Token-Ring LAN Emulation client—and the services portion to boot—thanks to the company's ties to that market.

Finally, in our performance testing, Olicom was right there running neck and neck with the adapter from Fore Systems, another acknowledged leader in this market.

PC MAGAZINE NETWORK EDITION EDITORS' CHOICE

The ForeRunner PCA-200EPC PCI Bus ATM Adapter earns an honorable mention. This third-generation NIC from Fore Systems interoperated well with every other card, worked with NetWare and Windows NT, and offered good utilities for help in troubleshooting. And its documentation includes good general information on ATM.

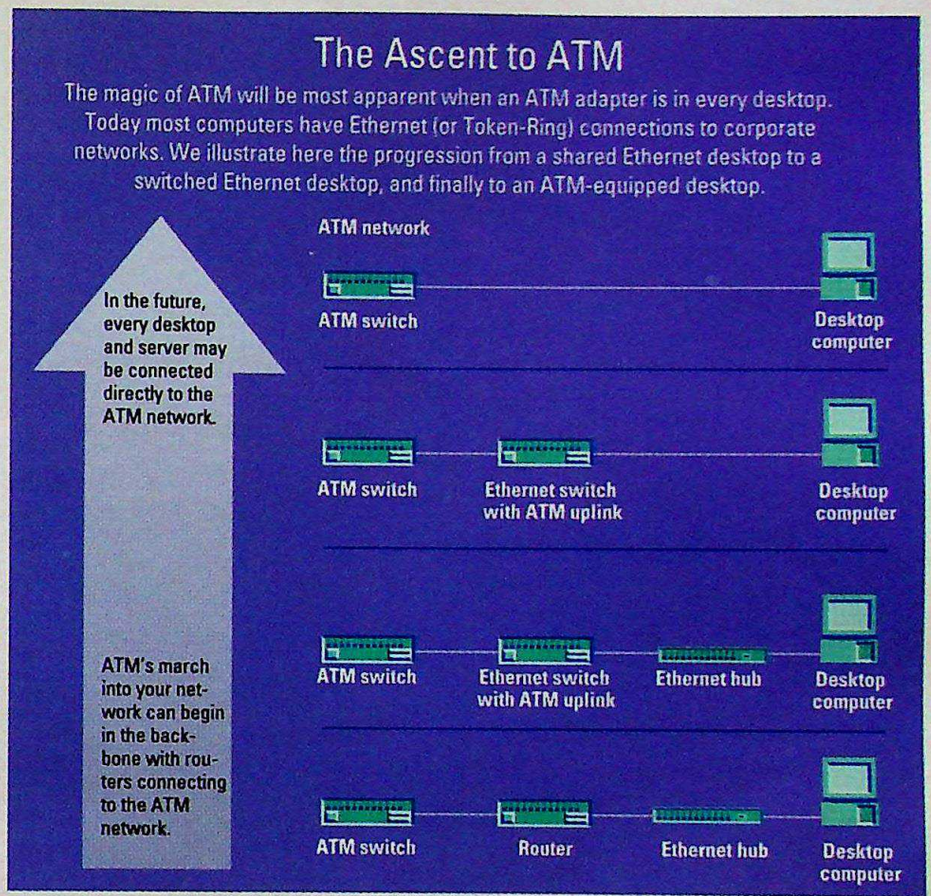
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the network devices themselves—the routers, for example—that play a large role in the communication. So in Ethernet (and Token-Ring) networks, the adapters don't need much intelligence. With ATM, the end-user stations with the ATM adapters control the communications, so they carry more significant software.

ATM drivers and software deal with such chores as virtual circuit creation and traffic management. They provide the link between current LAN protocols and ATM networks as well.

Some say that even though ATM products are shipping today, all ATM software is in most respects Beta code. We think this view has some merit, given what we observed in our testing. We found that even if vendors provided software floppy disks with the adapters, we usually had to download the latest version from a Web site. And it was not uncommon for new fixes to show up online from week to week during our testing. Interphase and Olicom units were the only products that worked seamlessly right out of the box. So if you're interested in trying out ATM, plan on spending a lot of time in the kitchen.



ATM: A TECHNOLOGY MAP

To be fair, there are in fact a few ways that ATM adapters can communicate with the ATM network today. In 1994, though, only proprietary methods were available, and companies such as Fore Systems developed proprietary software for ATM communication. The first standardized method for talking ATM was called Classical IP over ATM. It was defined by the Internet Engineering Task Force Request for Comment 1577.

This standard provided a way for applications and networks using TCP/IP to use ATM as the underlying infrastructure. Although this was useful for TCP/IP networks, it provided no way for alternative network environments such as NetWare (IPX) or Windows NT (NetBIOS) environments to work with ATM. This hurdle was overcome with the introduction of LAN Emulation, a standard that provides ATM compatibility with current networks. As a bonus, LAN Emulation also provides for interoperability among ATM adapters.

Not surprisingly, none of the ATM adapters we tested work with DOS, and only the Olicom adapter worked with Windows for Workgroups and Windows 95. We tested all of these adapters with the more robust 32-bit OSs—Windows NT and NetWare. You need a robust and fast 32-bit OS to work under the rigors of ATM. In addition, the adapter vendors recommended that each of our desktop PCs have 32MB of RAM; we fitted our servers with 64MB.

On the hardware side, these adapters worked with either Category 5 copper cable or multimode fiber (MMF). We asked vendors to send us copper versions, and Adaptec, Fore Systems, and ZeitNet did. For vendors that offer both copper and fiber options, the ATM portion of the adapter is the same—only the lower physical-layer components are different—so the fiber and copper products should perform identically. We found that all these products require Pentium-class machines with PCI buses for acceptable performance.

The future is bright for asynchronous transfer mode, but we expect most people to wait for lower prices and more applications written directly for ATM. Still, today's ATM can fit nicely into your network, and we expect that on some distant day most networks will be filled with ATM. We will follow the emerging products closely over the next few years. Here's what's out there today.

Adaptec Inc.

Adaptec ATM155 for PCI

ALL REVIEWS BY
ROBERT P. LIPSCHUTZ

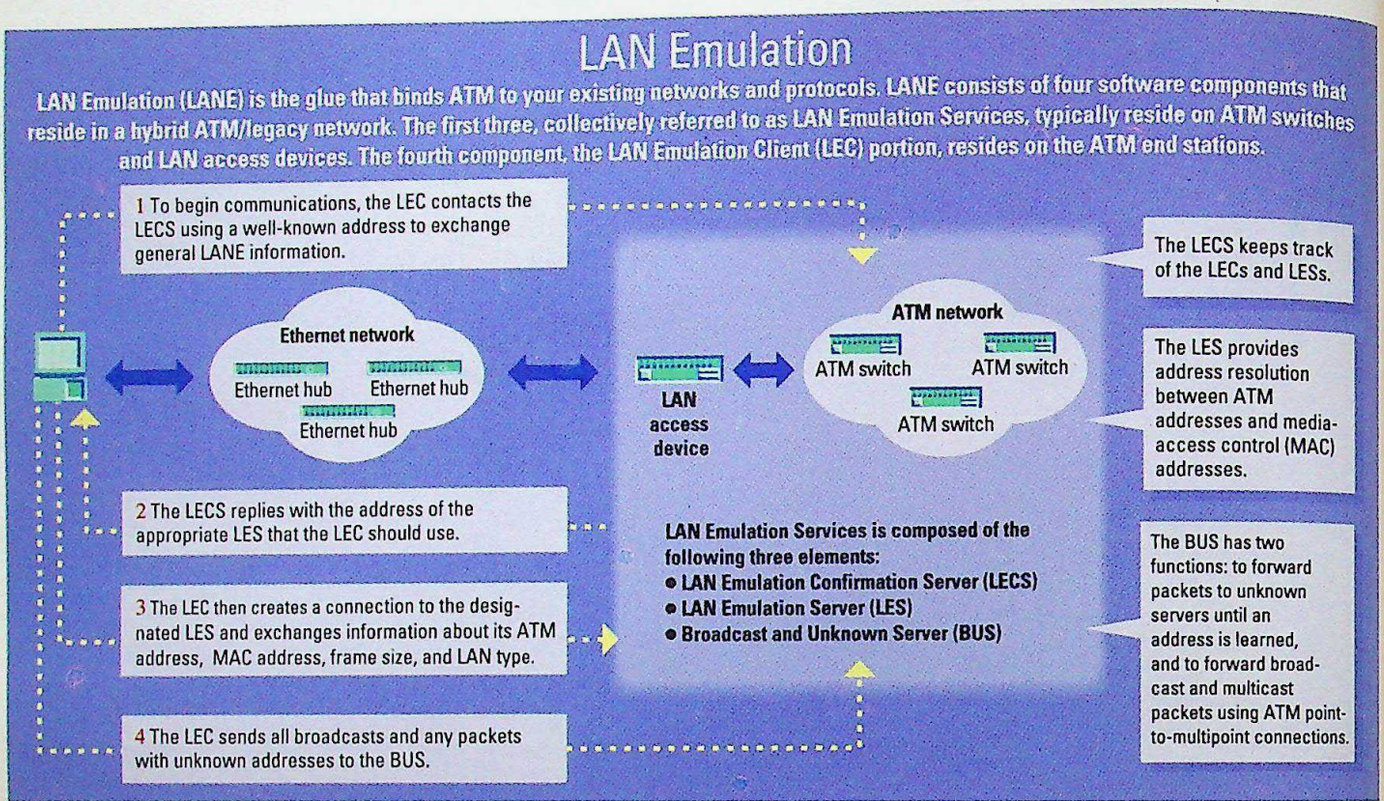
The king of SCSI has broadened its definition of *input/output.* Branching out into network I/O, Adaptec has made a significant move into the ATM adapter business. Although its biggest push is towards 25-Mbps ATM, Adaptec also sells a 155-Mbps adapter for both *x*86 and Sun SPARC platforms. We reviewed the Adaptec ATM155 for PCI and found it serviceable for ATM desktops. At $895, it's not a bad deal either. (Adaptec also sells an MMF adapter for $995.)

We tested the UTP adapter with a new release of Adaptec's LAN Emulation client software. We downloaded the software on its official release day—and ran into a few installation problems. Even so, its software configuration was a vast improvement over the previous version, in which users had to start the drivers manually in a DOS window.

Like the other adapters reviewed, Adaptec's is installed through the Network Control Panel in Windows NT. Adaptec's two-driver architecture, however, makes for a somewhat confusing installation. First, you give a placeholder TCP/IP address to the

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standard driver. Then you install the new LAN Emulation portion of the software as a second adapter. This is the driver you actually need to configure correctly. Clearly there are still a few bugs to work through.

This adapter's performance lagged behind the others here, with a throughput of 14.2 Mbps on our two-client test. But the Adaptec was interoperable with the Olicom server adapter and the ForeRunner ASX-200BX. Signaling and LAN Emulation worked without a hitch.

Adaptec's LAN Emulation software currently supports Ethernet LAN Emulation with 1.5K and 9K MTUs. Each adapter can be a member of four emulated LANs simultaneously, enough for most clients but probably insufficient for a server adapter. Adaptec is working on a server adapter, to be released later this year.

The included software also works with classical IP over ATM (RFC 1577) for those networks that use TCP/IP. Classical IP normally performs better than LAN Emulation because it uses 9K blocks. Regardless of whether you use LAN Emulation or classical IP, the adapter currently works only with Windows NT 3.51. Compatibility with NetWare, OS/2, and other NOSs is planned for later this year.

The Adaptec software includes an SNMP agent that complies with the current draft of the ATM MIB. This software is installed automatically when the adapter is configured.

Adaptec hopes to leverage its reputation in the SCSI business with its jaunt into networking. Although its ATM adapter is not rich in features, it worked well in our testing.

> Each Adaptec adapter can be a member of four emulated LANs simultaneously, enough for most clients but probably not for a server.

Adaptec ATM155 for PCI. List price: Copper, $895; fiber, $995. Adaptec Inc., Milpitas, CA.
(No Indian partner.)

Fore Systems Inc.

ForeRunner PCA-200EPC PCI Bus ATM Adapter

Fore Systems has delivered on its promise to supply standards-based ATM products. The latest release of ForeThought—Version 4.0—complies with the ATM Forum LAN Emulation 1.0 and User to Network Interface (UNI) 3.0. In addition, for the first time Fore's ATM switches will work with any adapter that's in compliance with the LAN Emulation specification, and Fore adapters will work with any compliant ATM switch.

This is magic in the ATM community, because it signals a large step forward in ATM interoperability. Here we review Fore Systems' ForeRunner PCA-200EPC PCI Bus ATM adapter, a third-generation ATM adapter, with the new LAN Emulation code.

The Fore adapter performed best of the adapters we tested, coming in at 13.8 Mbps on our single-client test. (Remember that LAN Emulation carries significant overhead and that the Windows NT networking protocols are not optimized for ATM's high speeds.) We found the adapter interoperable with all others in the review, which is perhaps more important than performance.

We installed and tested the Category 5 copper version of the adapter, but an MMF fiber version is also available for $1,195. Once we had the adapter in our Deskpros, we ran into the error message "I/O ROM Error." A Fore Systems technical-support staffer told us that the error would not affect our installation, and indeed it didn't. A Compaq BIOS upgrade fixed the problem.

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- February, 1996, Lars Danielsson, PCWORLD

A combination of strong ease of use and high-performance connectivity should put Oracle Corp.'s new Power Objects in the company of the top desktop development tools.
- August 7, 1995, Ed Dowgiallo, INFOWORLD

Oracle Corp. has done an outstanding job of simplifying the development of general-purpose client/server applications with Power Objects 1.0, an easy-to-use, 16 bit programmable front-end tool the company released in late July.
- September 6, 1995, Bob Gallagher, PCWEEK"

Clarion 4V0E16

Within a few months of its release, Oracle Power Objects, the front-end visual programming tool for standalone and workgroup application development, has taken the entire IT industry by storm.
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PERFORMANCE TESTS

ATM Adapters

PC MAGAZINE LABS

With each of these 155-Mbps ATM adapters, you'll pay a considerable throughput premium if you need to do LAN Emulation. In our testing, throughput was only about 15 to 20 Mbps. A faster server CPU can help, but not significantly.

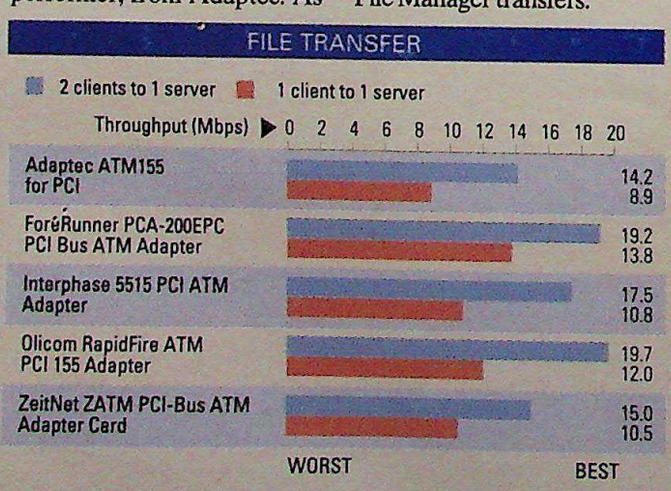
What the Numbers Mean

Once you look at the throughput scores these adapters turned in, you might wonder why they're called 155-Mbps adapters and not 15-Mbps adapters. Our fastest performer, the ForeRunner PCA-200EPC PCI Bus ATM Adapter, ran at under 15 Mbps of throughput for a client-to-server connection. The reason is overhead. It turns out that the overhead of both LAN Emulation and Windows NT networking holds ATM back to these rather mundane performance results.

We further observed that the adapters' performance had no correlation to the amount of buffer RAM each had. It probably had more to do with the LAN Emulation implementation in software. We saw a wide spread in performance, with the ForeRunner coming in about 5 Mbps faster than our slowest performer, from Adaptec. As we added a second client to the mix, our best performers, the Olicom and Fore Systems adapters, peaked at just below 20 Mbps, still far below what you might expect.

In some additional testing (whose results are not shown here), we found that adding clients did not increase the aggregate performance; that is, our faster server adapters still peaked at only 20 Mbps. Using just three clients, Windows NT Performance Monitor showed the server's CPU under full use, at about 95 percent. This accounts for the leveling-out in performance we observed.

To test the importance of the server CPU, we replaced our Pentium/66 with a dual-Pentium/133 server and attained a maximum of 30 Mbps. This is still not what you might expect, but probably the best you'll see using Ethernet LAN Emulation with Windows NT File Manager transfers.



The conclusion for now: Use the fastest server you have, because your ATM performance is going to be limited if you need to use LAN Emulation. One trick we didn't try was to raise the Maximum Transmission Unit (MTU) size in the LAN Emulation clients and servers (if they support it). The LAN Emulation standard allows for four sizes (1.5K, 4K, 9K, and 18K); the larger the size, the better the performance. But you won't be able to bridge Ethernet with ATM unless you stick with the 1.5K Ethernet maximum, and our Fore switch supported only 1.5K.

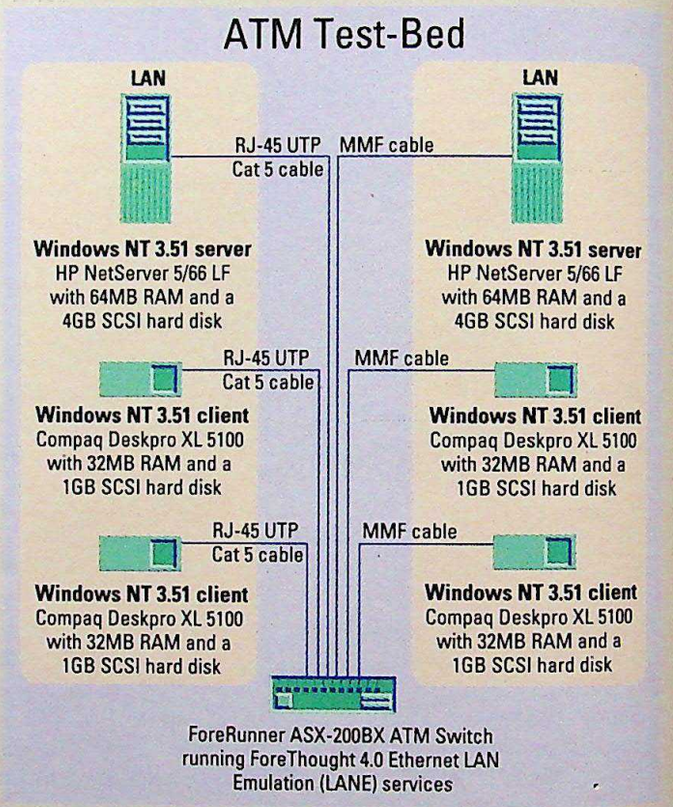
How We Tested

We used a ForeRunner ASX-200BX ATM switch as the backbone of our test-bed. Our Fore switch ran ForeThought Ethernet LAN Emulation (LANE) services. We used a 1.5K MTU, the largest size supported by the Fore Systems ATM switch.

We used the NTFS file system for our Windows NT 3.51 servers and the FAT file system for our Windows NT 3.51 clients.

On our single-client file-transfer test, we copied a 48.75MB test file from the server to a client using Windows NT's File Manager. First, we copied the test file five times, to fill up the server's memory cache. On the sixth time, we used a stopwatch to measure the file download time. We ran the test three times on each product and averaged the results. We translated the test timings into file-throughput scores (test-file size divided by average timing) in megabits per second (Mbps).

On our two-client test, we ran the same transfer, but with two clients simultaneously. We report the total throughput of both clients.—*Analysis written by Robert P. Lipshutz*



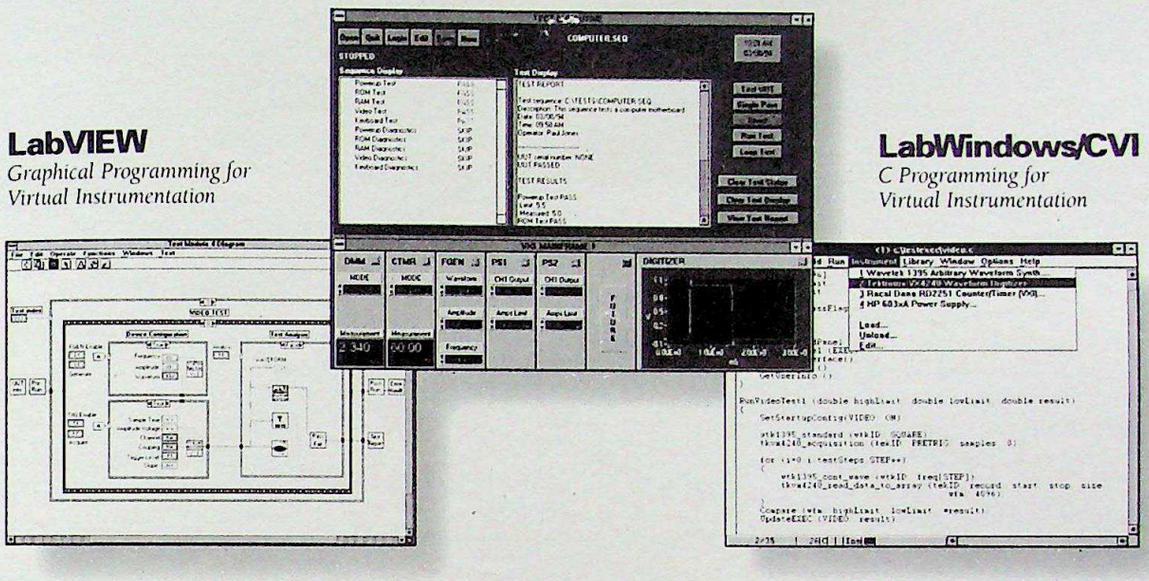
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Tomorrow Is Here Today: 25-Mbps ATM

By Ste e Buehler

When ATM specifications were being worked on in 1993, one company—IBM— suggested a "user-speed interface" for the new technology. The goal was to develop a connection scheme that was much faster than Ethernet and Token-Ring methodologies, one that could be sold at reasonable prices and still run over the large, already installed base of Category 3 copper cable. Based on Token-Ring's 32-MHz wire speed, IBM's proposal included a 4/5 redundancy scheme that yielded a throughput of 25.6 Mbps.

After a slow start, a 25-Mbps ATM spec was finally developed, and a small but growing number of companies began serious work on delivering products. Now, three years after the groundwork was laid, the first products using this architecture are rolling out. They're priced nicely between shared Ethernet and such true high-speed (100-Mbps) technologies as Fast Ethernet and 100VG-AnyLAN.

Many of the players in this market are focusing on building 25-Mbps ATM workgroups that get linked to a 155-Mbps ATM backbone, but some vendors have also added the path of easy migration from Ethernet. Madge Networks, for example, offers a line of adapters that connect to its Collage 280 Workgroup ATM Switch ($7,795). The Collage 280 offers 12 desktop ports that auto-switch between 10-Mbps switched Ethernet and 25-Mbps ATM. The stackable architecture can yield as many as 144 ports.

ODS takes another approach: It focuses on 12-port ATM modules that fit into its Infinity line of hubs. The1094-ATM25-12 module ($7,200) is designed for companies that are staying with enterprise or backplane central-site hubs. ODS believes that some enterprise workgroups will migrate as needs arise and that the existing architecture should keep those leading-edge users happy.

IBM recently announced a low-cost ATM 25-Mbps solution. The 8285 Nways switch, available with connections for 12, 24, 36, or 48 users and an optional 155-Mbps uplink, is available in packages with adapters for just under $500 per seat. This compares quite favorably with approximate per-port costs of $2,000 for Fast Ethernet, $1,000 for switched Ethernet, and $250 for standard Ethernet.

Several other vendors are providing parts of 25-Mbps solutions, with more vendors announcing products each month. Products from such long-time ATM developers as ConnectWare, First Virtual, Interphase, and Whitetree are all part of the options available for pilot projects or for the increasing number of 25-Mbps requests for proposal (RFPs) that are being released by network purchasers.

Many of the players in this market are focusing on building 25-Mbps ATM workgroups that get linked to a 155-Mbps ATM backbone, but some vendors have also added the path of easy migration from Ethernet.

THE DARK SIDE AND THE LIGHTER SIDE

The dark spot in this picture is the slow adoption of the technology and the lack of tools for analysis and setup. Many companies are waiting to hear about proven interoperability and a complete production process before they make major commitments to 25-Mbps ATM. Furthermore, few network tools are available as yet for 25-Mbps ATM. Such major network-analysis companies as Network General and Fluke have not yet committed to the same types of tools now available for Fast Ethernet or even 100VG-AnyLAN.

Don't worry, though. The number of players and the number of products are sure to grow. Several companies have successfully implemented 25-Mbps ATM on the desktop, where high bandwidth is a requirement. But while today's CAD/CAM work-groups in automobile design studios and training programs in dental schools prove its feasibility, its rollout and acceptance will be slow.

And it's unlikely that ATM 25's costs will drop quickly in the near future: There's still some engineering to do, chip volumes are low, and $500 is a reasonable cost per seat for this level of bandwidth. But if you're looking to make a strategic decision about replacing your organization's current desktop machines, examine how you'll connect those PCI-based Pentium-class machines you're going to buy in the next year or two. For reasonable prices and more speed than most of your users will need, check out 25-Mbps ATM.

Installation of the ForeRunner was similar to that of the Adaptec ATM155 in that we had to install two software-driver components in the Windows NT Network Control Panel: the ForeRunner PCA ATM Adapter driver and the ForeRunner ATM Ethernet LAN Adapter driver. We had the guidance of Fore's excellent documentation, the best we encountered in this group. It contains clear, concise information on general ATM concepts, adapter hardware and software configuration, and troubleshooting.

At review time, Fore did not include classical IP over ATM support with ForeThought 4.0. Classical IP is still available in ForeThought Version 1.2, though, along with ForeIP and SPANS. With each adapter, customers can choose between Version 1.2, Fore's proprietary offering, and Version 4.0, the standards-based LAN Emulation offering. ForeThought 4.0 is available for Windows NT and NetWare, and Fore will add other OSs later this year.

Included with the adapter, Fore provides monitoring, troubleshooting, and logging tools. Under Windows NT, the Fore ATM Statistics icon is installed in the Control Panel; when invoked, the icon displays information about ATM connections with useful information about LAN Emulation status.

We found the LAN Emulation statistics helpful in troubleshooting the adapter. Under NetWare, an NLM called the Fore-

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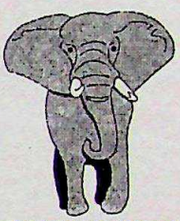
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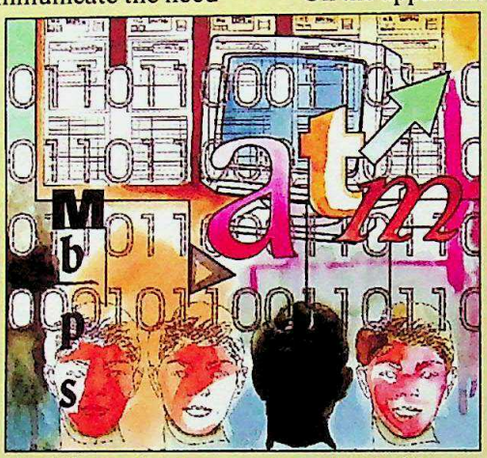
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It Does Get Better than This!

By Robert P. Lipschutz

Current applications and operating systems were not designed to work with connection-oriented ATM networks. Applications have no way to talk with the underlying network to communicate the need for the priority or bandwidth that ATM can provide. In addition, operating systems like Windows NT and NetWare are notorious for using broadcast packets, a surefire way to decrease performance on ATM networks.



LAN Emulation provides the interoperability layer between current applications and ATM networks, but it cannot take full advantage of ATM's potential to provide a higher quality of service. We've heard this characterization of LAN Emulation, and we think it fits: "The advantage of LAN Emulation is that the applications don't know they're running over ATM. The disadvantage of LAN Emulation is that the applications don't know they're running over ATM." For optimal ATM networks, operating systems should minimize broadcast traffic, and applications should be smart enough to talk with the underlying network.

The major operating-system vendors are working on this problem. Both Microsoft and Novell have announced plans for connection-oriented abstraction layers. Microsoft has licensed code from Olicom, and Novell is working with Fore Systems. We expect to see some major improvements over the next year.

On the application side, the ATM Forum had been working on a standard ATM API that application vendors could use to write native ATM applications. This effort has stalled a bit, and the ATM Forum is giving its full support to the WinSock 2.0 efforts. WinSock 1.1 provided a layer between Windows applications and the lower-layer network protocol stack, usually TCP/IP. WinSock 2.0 will go one step further by providing extensions for connection-oriented networks like ATM and ISDN. We expect each of the ATM adapter vendors to provide proprietary APIs as well.

Imagine having videoconferencing, broadcast video, and all of your e-mail arriving simultaneously at your corporate desktop. This is the kind of thing you'll be able to do over ATM.

In the next couple of years, we hope there will be de facto standards for application-to-ATM communication. Only then will ATM deliver on its grand promise.

Thought ATM Console displays the same statistics.

Fore Systems' LAN Emulation software was a top achiever on our performance tests and worked with the other adapters. Fore Systems' debut into LAN Emulation proved a promising one.

ForeRunner PCA-200EPC PCI Bus ATM Adapter. List price: Copper, $995; fiber, $1,195. Fore Systems Inc., Warrendale, PA.

(Indian partner Intercon Systems, 202 Thaper House, N161 Community Centre, Gulmohar Encla e, New Delhi 110 049. Tel : 6850 234; Fax: 6850234.)

Interphase Corp.

Interphase 5515 PCI ATM Adapter

This adapter struck us as the best value here for Windows NT *desktop* computers. With its low price ($650 with copper cable, $850 fiber cable), lifetime warranty, and acceptable performance, we could see buying a dozen or more.

The Interphase 5515 PCI ATM Adapter is also the best choice if you have some PowerPCs you need to connect to the ATM network—the Interphase 5515 included software drivers for that Macintosh-friendly platform. We would not, however, recommend the Interphase 5515 as a server adapter, because it allows just a single ELAN per adapter; additional ELAN support will accompany the next version of the Interphase software.

> The Interphase 5515 allows just a single emulated LAN per adapter, so it is best suited for client PCs.

As with many of the products in this review, we downloaded the latest software from the vendor's Web site. Installation followed the general pattern we'd run into with the other adapters: The network adapter and ATM signaling transport software install through the Windows NT Network Control Panel.

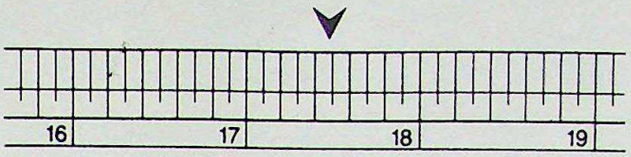
The Interphase 5515 offers a choice of three MTU sizes (1.5K, 4.5K, and 9K); for ATM-only networks, choosing the 9K option will improve performance. The Ethernet LAN Emulation Services resident on the Fore Systems switch work only with 1.5K MTU, but Interphase offers a Solaris-based product that works with MTUs up to 9K. ELANs that bridge Ethernet and ATM networks must use a 1.5K MTU for compatibility.

The Interphase adapter's performance was similar to that of the others here. It came in at 10.8 Mbps on the single-client version of our test and 17.5 Mbps on the two-client version. Although not the fastest in this roundup, the Interphase 5515 would end up at the top of the heap in a price/performance index for the group. The adapters come standard with 128K of buffer RAM, but this can be increased to 512K ($1,050). Adding buffer RAM can help the performance for some applications.

Here's another plus for Interphase: The company has a comarketing agreement with Bay Networks that matches Bay Networks' line of ATM switches and LAN ac-

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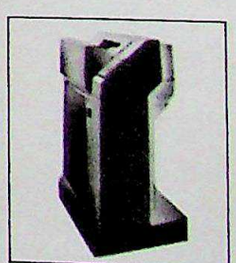
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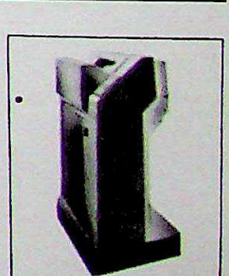
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cess devices with the broad line of Interphase adapters, making for a complete ATM solution. This is an important selling point for customers looking for one-stop shopping.

Interphase plans to introduce Windows for Workgroups and Windows 95 software sometime this summer to accommodate a broader range of corporate client types. We believe these changes, along with a new line of ATM 25 adapters, will keep Interphase high on your list for desktop ATM.

Interphase 5515 PCI ATM Adapter. List price: Copper, $650; fiber, $850. Interphase Corp., Dallas, TX.
(No Indian partner.)

Olicom USA Inc.

RapidFire ATM PCI 155 Adapter

Olicom USA's RapidFire ATM PCI 155 Adapter is rather like the Swiss Army knife of ATM adapters. It has a first-rate collection of features and functions—the best here—and its hardware and software worked very well during our tests. In performance testing, the RapidFire was at the front of the pack and worked well with our ATM switch and other adapters. Moreover, of the companies in this roundup, Olicom is the furthest along with its product; it seems to have an answer to almost every problem. We were impressed—we named the RapidFire our Editors' Choice.

You begin to understand that this ATM adapter is different when you realize that it contains driver software not only for Windows NT (like the other products) but also for NetWare 3.*x* and 4.*x*, Windows for Workgroups, and Windows 95. We concentrated on Windows NT, but we did some additional testing using the NetWare drivers with equal success.

We installed the RapidFire software and attached our fiber cable to the SC connector. We observed that all of the fiber adapters in this review had the SC connector (now the most popular fiber connector type for adapters). At $50 to $100 per cable, make sure you order the proper fiber cables as you set up your ATM network. Olicom also sells an adapter for use with Category 5 copper ($895 with a 128K buffer).

SUMMARY OF FEATURES

ATM 155-Mbps Adapters

■ YES ■ NO

	Adaptec Inc. **Adaptec ATM155 for PCI**	Fore Systems Inc. **ForeRunner PCA-200EPC PCI Bus ATM Adapter**	Interphase Corp. **Interphase 5515 PCI ATM Adapter**	Olicom USA Inc. **RapidFire ATM PCI 155 Adapter** (PC MAGAZINE NETWORK EDITION EDITORS' CHOICE)	ZeitNet Inc **ZeitNet ZATM PCI-Bus ATM Adapter Card**
List price	$895	$995	$850	$995	$995
Warranty	5 years	1 year	Lifetime	3 years	1 year
Hardware					
PCI-bus architecture	■	■	■	■	■
Physical interface	Category 5 UTP copper cable	Category 5 UTP copper cable	SC multimode fiber	SC multimode fiber	Category 5 UTP copper cable
Buffer memory	512Kb	18K for transmitting, 106K for receiving	128Kb	512Kb	N/A
FCC class A–/B–compliant	■ ■	■ ■	■ ■	■ ■	■ ■
ATM Adapter Software					
Name and version	Base Driver 2.0, LANE Driver 1.0	ForeThought 4.0	Windows NT LAN Emulation SVC A05	CellDriver 1.0	ZNATM 3.0, ZNMUX 3.0
Minimum RAM required	16MB	16MB	16MB	16MB	24MB
Maximum ELANs per adapter	4	12	1	4	8
Supports SVCs	■	■	■	■	■
Provides statistics-viewing application	■	■	■	■	■
LAN Emulation Client					
Ethernet	■	■	■	■	■
Token-Ring	■	■	■	■	■
MTU sizes supported	1.5K, 9K	1.5K, 9K	1.5K,4.5K, 9K	1.5K, 4.5K*, 9K*	1.5K, 4.5K, 9K
Supported Standards					
Supports classical IP1111 over ATM	■	■	■	■	■
Supports bridged Ethernet	■	■	■	■	■
UNI 3.0/3.1 signaling	■ ■	■ ■	■ ■	■ ■	■ ■
Compatible Operating Systems					
Windows NT 3.51 platforms:					
*x*86	■	■	■	■	■
Alpha	■	■	■	■	■
PowerPC	■	■	■	■	■
Windows 95 (NDIS 3.0)	■	■	■	■	■
Windows for Workgroups 3.11	■	■	■	■	■
NetWare 3.12/4.1	■ ■	■ ■	■ ■	■ ■	■ ■
OS/2 Warp Connect	■	■	■	■	■
DOS 6.22	■	■	■	■	■

N/A—Not applicable: The product uses system memory only.
*This MTU size is available for Token-Ring only.

The software installation went very smoothly, a welcome contrast to our experience with other products in this roundup. We installed it right out of the box with no stumbling blocks. As with the other packages, the software drivers install through the Windows NT Network Control panel. You might need to fiddle with one configuration file in DOS, but we used default parameters, so this file was unnecessary in our case. The documentation contained a bit of jargon, but overall it was informative and clear.

In addition to its wide array of operating-system support, Olicom's was the only adapter to include a Token-Ring LAN Emulation client. Because Token-Ring emulation services are not yet found in many switches (including Fore Systems ASX-200BX), Olicom also includes the LAN Emulation Services portion with the adapters. Olicom's LAN Emulation Services run on a dedicated PC host.

The only component missing from this

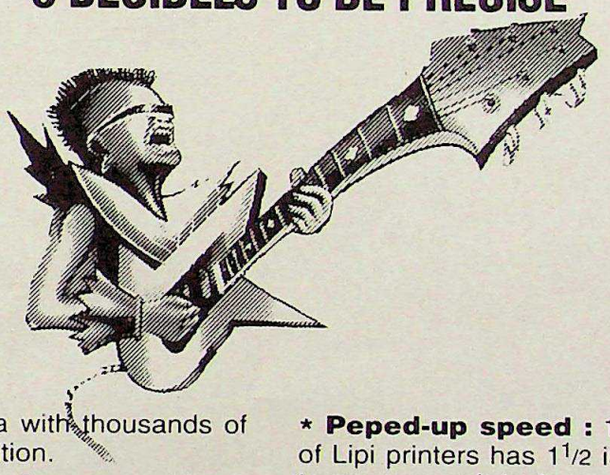
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WITH ALMOST ALL OUR FEATURES SCORING OVER THE COMPETITION,

IT'S NATURAL LIPI PRINTERS DO MAKE SOME NOISE,

3 DECIBELS TO BE PRECISE

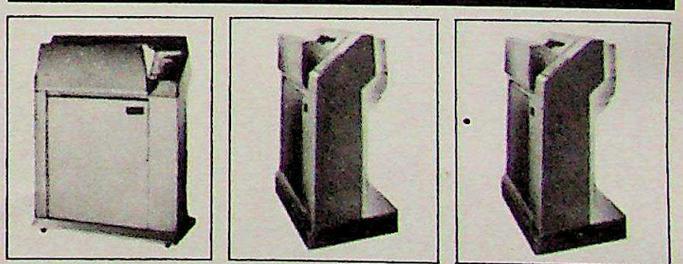


* **Proven reliability :** In India with thousands of installations against nil of competition.
* **Superior Print Quality :** Because of hard material used for printing elements.
* **Superior Paper Transport :** 4 tractors for reliable and fast paper movement and also reverse paper motion for printing graphics. Competition has only 2 tractors.
* **Multiple Interface :** Simultaneously active serial and parallel shared interfaces with auto switching, while competition requires selection from the front panel.
* **In-line ethernet interface :** Network printer.

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* **Peped-up speed :** 17 1/2 inch carriage (optional) of Lipi printers has 1 1/2 inch of added carriage width to accommodate large size forms like two Bank Cheques / Share Certificates printed abreast, thus doubling the throughput as compared to the competition. This gives you an advantage of having two printers for the price of one.

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IMPULSE/995

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version of software is classical IP over ATM. Olicom has concentrated its development efforts on LAN Emulation for this PC adapter. The company plans to ship the classical IP driver for this adapter later this year.

We are not alone in being impressed with Olicom's implementation of software and hardware: Last August, Microsoft chose to license Olicom's ATM code for inclusion in Windows NT.

RapidFire ATM PCI 155 Adapter. List price: Copper, $895; fiber, $995. Olicom USA Inc., Plano, TX.
(No Indian partner.)

ZeitNet Inc.

ZeitNet ZATM PCI-Bus ATM Adapter Card

The ZeitNet ZATM PCI-Bus ATM Adapter Card has plenty of user-configurable functionality, but we found a few glitches with the software that dampened our initial enthusiasm. We were able to work through those problems, though, and the ZATM PCI Adapter was certainly acceptable in our performance and interoperability testing.

The adapter software required 24MB of system memory—more than the other adapters in the roundup—partly because there is no buffer RAM on the adapter itself. The ZATM PCI Adapter uses the computer's memory for buffering packets. This might have been a reason for its lower performance test results. It finished fourth in our performance testing, just beating out the Adaptec ATM155 on the two-client version of our test.

The ZATM PCI Adapter does offer some useful software features. For example, each adapter can have eight simultaneous ELANs, making it a good choice for a server adapter. Only Fore Systems' adapter had more. And the software supports classical IP over ATM for connecting with other TCP/IP ATM clients.

We tested the Category 5 copper version of the adapter (an MMF version is available for $1,095). After we installed the adapter, the installation of the software was a bit choppy. As with all the adapters in the roundup except Olicom's, two steps were required in the Windows NT Network Control panel, and the sequence of the steps can be a bit confusing.

Also, when configuring the adapter, we had to indicate the default LANE name expressly or an incorrect zero value was chosen, causing connection problems. We had some difficulties at first getting the adapter to work with our Fore Systems switch, but ZeitNet engineers were able to provide a patch that fixed some signaling-level timing problems that initially prevented the adapter from working.

ZeitNet's ZNAdmin exposes many ATM parameters through its GUI interface, and it was the most powerful utility we saw in this roundup. We did not have occasion to use most of the parameters, but they could come in handy if you're configuring adapters with multiple ELANs and different cell rates. The utility reports some useful ATM and LAN Emulation statistics, and it even includes some simple diagnostics tests. When you're getting started, you could spend a few hours just learning about ZNAdmin itself. Fortunately, the ZNAdmin functions are clearly described in the well-organized user guide.

> ZeitNet's ZATM PCI Adapter requires 24MB of system RAM, but each adapter can be a member of eight simultaneous emulated LANs.

The current release of software works with Windows NT and NetWare 4.1; ZeitNet says we'll see Windows 95 and Windows for Workgroups 3.11 driver support in late spring of this year. ZeitNet offers a full line of 155-Mbps ATM adapters, including S-Bus and EISA. We expect that once the company tones up in a few areas, it will have one of the most powerful ATM software packages available. In fact, Cisco Systems already resells ZeitNet adapters as part of its complete ATM solution. ❑

ZeitNet ZATM PCI-Bus ATM Adapter Card. List price: Copper, $995; fiber, $1,095. ZeitNet Inc., Santa Clara, CA..

(Indian subsidiary ZeitNet India, Cosmic Radio Building, 23 Mahal Industrial Estate, Mahakali Ca es Roads, Andheri East, Bombay 400 093. Tel : 8352124; Fax : 8356603.)

ATM Workgroup Switches

■ YES ■ NO

Vendor	Product	Provides LAN Emulation services	Provides Ethernet LAN Emulation	Provides Token-Ring LAN Emulation	Supports ATM25/ ATM155/ATM622	URL address: *http://www*	Shipping
Bay Networks Inc.	Centillion 100	■	■	■	■■■	*baynetworks.com*	Now
Cisco Systems Inc.	LightStream 1010	■	■	■	■■■	*cisco.com*	By the time you read this
CrossCom Corp.	XLX ATM Switch	■	■	■	■■■	*crosscomm.com*	By the time you read this
Fore Systems Inc.	ForeRunner ASX-200WG ATM Workgroup Switch	■	■	■	■■■	*fore.com*	Now
General DataComm Inc.	GDC APEX-MAC	■	■	■	■■■	*gdc.com*	Now
IBM Corp.	IBM 8285 Nways ATM Workgroup Switch	■	■	■	■■*■	*ibm.com*	By the time you read this
Newbridge Networks Corp.	Vivid Workgroup Switch	■	■	■	■■■	*vivid.newbridge .com*	Now
3Com Corp.	ONsemble ATM 25Mbps Workgroup Concentrator	■	■	■	■■■	*3com.com*	Now
UB Networks Inc.	GeoSwitch/155	■	■	■	■■■	*ub.com*	Now
Whitetree Network Technologies Inc.	WhitetreeWS3000 Workgroup Switch	■	■	■	■■■	*whitetree.com*	Now

*The product provides 155-Mbps throughput to the backbone.

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HANDS-ON REVIEWS OF NEW NETWORKING PRODUCTS

WINDOWS NT–BASED WEB SERVERS

The Web Rolls On

By O. Ryan Tabibian and Robert P. Lipschutz

The Web, it is a-changin'. Initially designed as a way for scientists to share information graphically, the Web has become the hottest thing since the personal computer was introduced back in 1981. Still, many challenges exist for using Web servers in business environments. As the importance of the Internet for businesses has grown, providing secure, interactive information, along with hooks to databases, has become paramount.

What is also changing is the platform of choice for running Web servers. Unix is still dominant, but Microsoft Windows NT is making great inroads. In these reviews, we look at the newest Windows NT–based Web Servers: CompuServe Internet Division's Spry SafetyWeb Server, Internet Factory's Commerce Builder, and Microsoft Internet Information Server. These offer not only simple HTTP service, but the needed SSL security and enterprise database connectivity. Also, Netscape has just announced two new servers—Netscape and FastTrack Server 2.0—and O'Reilly's Web Site Web Server is getting lots of attention as well.

Most companies now allow anonymous access to entire Web sites, which is fine for advertising and public posting of information. But businesses need a way to restrict external access on valuable information. The trick is user names and passwords across the network.

Electronic commerce also requires secure, encrypted communication and new techniques for dealing with credit-card information. And as companies begin to use HTTP internally for sensitive information, the traditional security provided by encrypted user names and passwords will become important.

The Internet Factory Inc.

Commerce Builder

If you want a Windows NT–based Web server packed with features, which also happens to be affordable, then the second iteration of Commerce Builder (Version 1.5, $995) is worth investigating. The Internet Factory has been working diligently since our last review of Commerce Builder ("A Site of Your Own," October 10, 1995). The package now comes in both Windows NT and Windows 95 versions.

The previous version of Commerce Builder included Secure Sockets Layer (SSL) security, powerful management tools, Chat Room, and Proxy Server, just as this version does. But a slew of new features that allow you to integrate Web sites smoothly with corporate databases have rounded out the product.

The first of these enhancements is a set of ODBC drivers, which simplify access to popular Windows-based databases such as Microsoft SQL Server. These drivers allow you both to integrate your HTML documents and to create Web pages dynamically, all with information pulled from your databases.

Also included with this server are support for Common Gateway Interface (CGI) scripting and Internet Server APIs (ISAPIs), a set of Microsoft APIs that simplify the creation of Web server enhancements using Windows-based development tools like Microsoft Visual Basic.

In addition, Internet Factory has rolled out its own scripting language—Server Macro Expansion (SMX)—with this version. SMX makes adding enhancements to HTML pages much easier, because you just write macros instead of having to write entire CGI scripts. Catalogue Builder, a new feature lets you put SMX to use to make a quick Web storefront with forms, pricing, and other useful elements.

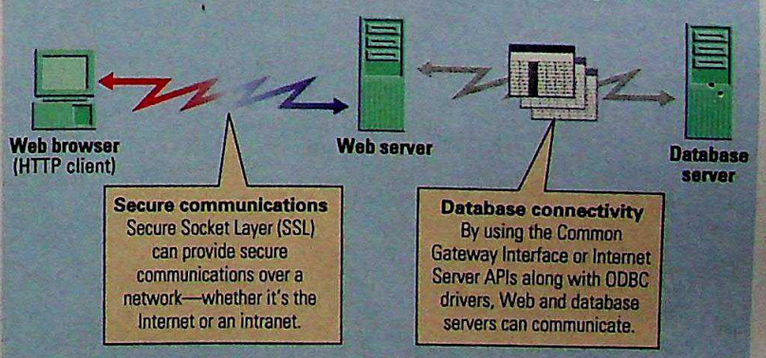
We found that installing Commerce Builder was a snap. We installed it on a Windows NT 3.51 server and had the product up in minutes. The security portion is based on SSL, so as with SafetyWeb, you need to get a digital certificate before you can enable security. Commerce Builder's manuals were disappointing; they were the same as those distributed with Version 1.0.

All management and configuration takes place using the tabular control-panel applet, which we found less friendly than SafetyWeb's management tool. But since the product installs as a Windows NT control-panel applet and is also a Windows NT Service, you can manage it remotely with Windows NT's remote-management tools.

Creating user databases under Commerce Builder is simple. You import users directly from the Windows NT database into Commerce Builder.

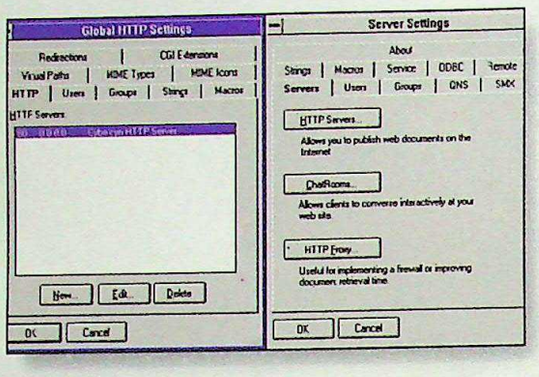
Web Servers Rise to the Challenge

The new generation of Web servers must handle two primary challenges: providing top-level security and database hooks. The servers we review have built-in Secure Socket Layer (SSL) capabilities for security and ODBC drivers to hook into internal databases. The importance of security is obvious—to keep your network safe from intruders and to allow you to do transaction processing over the Internet. But hooks to internal databases are also valuable. Built-in ODBC drivers help you pull information gleaned from your Web server into internal databases, letting you easily compile reports on user demographics and usage patterns.



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SERVER SET-UP: *Commerce Builder provides you with clear instructions on server capabilities and tells you how to set them up.*

Chat Room was one of our favorite Commerce Builder features, and there's nothing similar in SafetyWeb. Chat Room lets you create discussion forums on your Web server; it's similar to Internet Relay Chat, where the discussion is live. Furthermore, you can configure chat rooms to use SSL security.

Commerce Builder's built-in Proxy Server is also handy. We were able to create a list of sites that internal users could not access, which you can't do with SafetyWeb. Proxy Server also includes extensive logging capabilities, which you can use to analyze the usage patterns of internal Web surfers. This is great for companies that want to provide Internet access to all employees but don't want users to abuse the privilege.

Like SafetyWeb, Commerce Builder also includes a multihosting option. Using this feature you can create multiple Web servers with different IP addresses on the same machines. This feature has existed for Unix-based Web servers for a long time, but Commerce Builder and SafetyWeb are the first Windows NT–based Web servers to include it. Commerce Builder, like SafetyWeb, can log Web-server usage in either Common Log Format or Combined Log Format.

In addition to the $995 Commerce Builder, Internet Factory also offers a free version of the server, the Communications Builder, which you can download from its Web site. The only difference between the two servers is that you don't get SSL security or Catalogue Builder with Communications Builder.—*ORT*

Commerce Builder, Version 1.5. List price: $995. The Internet Factory Inc., Pleasanton, CA.

(No Indian partner.)

Microsoft Corp.

Microsoft Internet Information Server

Though Microsoft's entry into the Web-server arena could certainly be called no-frills, there's no question that the company is armed with an architecture that's ready for growth. The recently released Microsoft Internet Information Server (IIS) offers the basics—Web, FTP, and Gopher services—on top of a Windows NT 3.51 platform. And though IIS doesn't include much in the way of Web-authoring, content management, or indexing tools, it does have a well-defined architecture for database and application integration and security.

Our biggest installation obstacle was downloading the software from Microsoft's Web site. After submitting an electronic registration form, you receive an e-mail message guiding you to the appropriate download site. We encountered a few hitches along the way but finally downloaded the 5MB of files. Microsoft plans to have a $99 CD-ROM available by the time you read this.

IIS licenses and includes an implementation of the Secure Sockets Layer (SSL) specification. But each Web server must be certified through a valid SSL certificate authority. SSL uses public-private key technology developed by RSA, and the certification process essentially gives the server a private key.

Web browsers must also have an SSL component, which both NetScape Navigator 2.0 and Internet Explorer 2.0 do. When a browser attempts to display or download a page that has been given restricted access through Windows NT, a pop-up screen asks for a user name and password. Without an encryption method like SSL, this password would be sent across the wire. Clients using Internet Explorer 2.0 on Windows 95 can use a challenge-response system to send this user and password. The downloadable version of Internet Explorer 2.0 doesn't have challenge-response; you have to install it from the Windows NT 3.51 Server floppy disks.

In conjunction with the user names and password authentication provided by the Windows NT server, information can be presented securely both inside and outside the company firewall. Of course, you'll see a large performance hit because of the added encryption overhead.

Each HTML document can be secured by user or group permissions, which is part of the basic Windows NT package. Although most Web servers today use wide-open anonymous access, this won't always be the case. By using restricted access managed through permissions, businesses can provide more valuable content online.

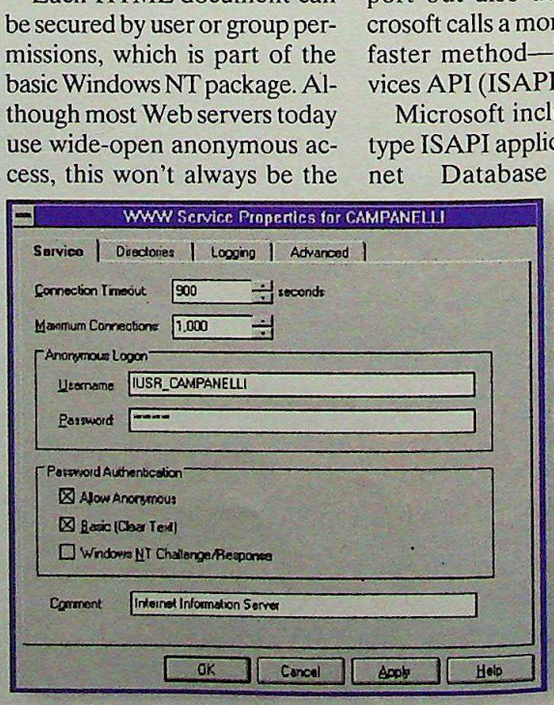
IIS provides basic logging but may not have enough functionality for sites serious about tracking usage. Each object hit is logged, along with the amount of data and the TCP/IP address.

You can output log information to a text file or optionally to a Microsoft SQL Server. The text output does not conform to Standard Log Format, but a text conversion utility is included. The conversion utility will also add domain names for each TCP/IP address. No conversion utility is included for the SQL Server database.

For additional server monitoring, the Windows NT Performance monitor includes a new group for HTTP statistics. But when we tested a few of these parameters, we saw some incorrect information.

The next generation of Web servers will need to do more than just display HTML pages; they'll need to integrate well with existing databases. Currently, the Common Gateway Interface (CGI) is the standard way for Web Servers to run processes that talk with database servers. IIS has CGI support but also adds what Microsoft calls a more flexible and faster method—Internet Services API (ISAPI).

Microsoft includes a prototype ISAPI application—Internet Database Connect



LET ME IN: *With IIS, you can set connection time-out, maximum connections and password authentication.*

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(IDC)—that works with ODBC drivers to attach to database servers. Microsoft includes the ODBC driver for its own SQL Server, but for other vendors' products, you'll need to use their ODBC drivers.

This first version of IIS shows Microsoft's intent in the Web-server arena. The company will work with existing standards like CGI and SSL, but will attempt to increase functionality through its own methods, such as ISAPI.

Microsoft believes that a Web server is just an extension of the operating system, and IIS does indeed use the underlying Windows NT architecture and user management. Though admittedly a good first effort, IIS needs many more features to use Windows NT's power fully.—*RPL*

Microsoft Internet Information Server, Version 1.0. List price: From Microsoft's Web site, free; CD-ROM version, $99. Microsoft Corp., Redmond, WA. *(Indian subsidiary Microsoft India, New Delhi; Indian partners Datapro Infoworld, Pune; Godrej Trading, Bombay; Sonata, Bangalore; TUL, Bombay.)*

Spry, CompuServe Internet Division

Spry SafetyWeb Server

Since the beginning of the Internet revolution, Spry has been known for providing desktop tools for connecting to the Internet. Now the next step has been taken. The company, recently acquired by CompuServe, has finally released its long-promised Web server—Spry SafetyWeb Server. It lives up to much of its prerelease hype by offering an easy-to-use server with built-in database connectivity and security at a reasonable price.

We tested the Microsoft Windows NT version of SafetyWeb Server ($1,295). It also comes in BSDIA, HP-UX, SGI IRIX, and Solaris 2.4 variants. SafetyWeb Server has the distinction of being one of the few non-Microsoft products to carry the Microsoft BackOffice Seal.

One of the product's most useful features is its included set of ODBC drivers. These let you easily link the server with popular databases like Microsoft Access. And prepackaging the drivers eliminates the need for complicated Common Gateway Interface (CGI) scripts to add database connectivity to Web sites.

SafetyWeb has other excellent features as well: Secure Sockets Layer (SSL) security, multihosting for setting up multiple Web servers with different IP addresses on the same server, a proxy server, and Internet Office Pro, a suite of desktop tools.

The package also includes Architext Software's Excite search engine and SoftQuad's HoTMetal PRO HTML editor. With Excite you can quickly create search engines for your Web site, and HoTMetal lets you create Web pages without manually adding HTML tags. HoTMetal is limited, however. Really best for novice users, it doesn't support some of the advanced HTML options, such as varying font sizes and scrolling text.

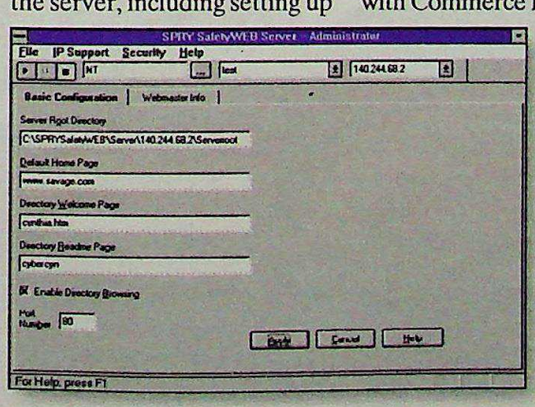
We installed the SafetyWeb Server on a Windows NT 3.51 Server and found the process simple and straightforward. Basic installation and configuration took only a few minutes, but configuring the security portion of the server was more complicated. Like Commerce Builder, it required a digital certificate from a certification authority.

Once installed, the server impressed us with both its functionality and ease of management. With the graphical management utility, you can centrally manage all aspects of the server, including setting up security, creating multiple servers, and setting port numbers from a single console.

Also, the server was well integrated with features within Windows NT. For example, you can add Web-server statistics to the Windows NT Performance Monitor and view critical Web-server information, such as total transactions and maximum concurrent sessions.

You can also manage SafetyWeb remotely from any Windows NT or Windows 95 machine on the network. But unlike Netscape Commerce Server, you can't manage SafetyWeb from anywhere on the Internet.

SafetyWeb does not take advantage of the Windows NT user database. It requires you to create users manually instead of importing them from the Windows NT database as you can with Commerce Builder.



SAFE SETTINGS: *The management tools built into SafetyWeb Server are highly functional and easy to use.*

One of SafetyWeb's best features is Proxy Server, which lets you tighten security by providing a single point of entry and exit for your network. SafetyWeb, however, cannot create URL filters that deny internal users from accessing certain sites.

Several logging options come with SafetyWeb. You can create a log file in either the Common Log format or the more recently released Combined Log Format, which can gather more critical data.

With Combined Log Format, you can collect information such as *referrer,* the URL of the server that the visitor comes from, and *browser,* the type of browser and operating system the visitor is using. Thanks to the ODBC drivers, you can import any of these logs directly to a database for easy manipulation and reporting.

Spry Web Server, a free version of this product, can be downloaded from the Web. The freebie, however, doesn't include SSL, Excite, HoTMetal, or Internet Office Pro.—*ORT*

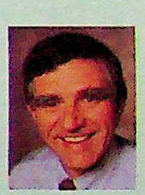
Spry SafetyWeb Server 1.0. List price: $1,295. Spry, CompuServe Internet Division, Bellevue, WA. *(No Indian partner.)*

Crosstalk



Gail Shaffer

"Frank, we shouldn't let our readers believe that Microsoft's new Internet Information Server is in real competition with Commerce Builder or SafetyWeb. We reviewed it because it's new and it's Microsoft, but Information Server is training wheels for the other two products. Microsoft has announced an upcoming version of Information Server that will be bundled for business, but companies that want to do Web business now can't wait!"



Frank Derfler

"You're right, Gail. While Microsoft develops this product, Internet years are flying by. Readers shouldn't skip over the ability of these products to act as proxy servers either. This technology lets you bring in only those Web sites that relate to your business and keeps your employees out of the land of the barbarians—and vice versa."

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NETWORK SCANNING DEVICES

Internet Scanner Finds Security Holes

By O. Ryan Tabibian

What with ghastly tales of hackers like Kevin Mitnick breaking into networks, and widespread direct access to the Internet in the workplace, anxiety about network security is higher than ever. As a result many organizations have installed a first line of defense—an Internet firewall.

A firewall is a great solution, but installing and configuring it properly can be tricky, possibly leaving your network vulnerable. So how do you verify that your network and system are as secure as they can be? The answer is a network scanning tool.

Internet Scanner 3.2 from Internet Security Systems is just such a product. It can probe either your entire network or specific hosts for lapses in security.

The first of the network scanners, Security Administrator Tool for Analyzing Networks (SATAN), gained notoriety in the summer of 1995. The United States Justice Department became concerned about national security issues raised by SATAN and threatened to press charges against Silicon Graphics where SATAN's coauthor, Dan Farmer, worked. But Farmer was fired, the Justice Department dropped its investigation, and development of these devices goes on.

Though Internet Scanner has maintained a lower profile than SATAN, it is much easier to use than SATAN or Qualix Group's NetProbe, another direct competitor. And Internet Scanner scans for a more expansive list of security problems.

The scans Internet Scanner performs are based on a set of known vulnerabilities rules. The product can probe for improperly configured NFS servers that export directories mountable by everyone or for older versions of Sendmail that have possible security holes. In fact, Internet Scanner can check for more than 100 known vulnerabilities. After the scans are run, Internet Scanner generates HTML-based reports, giving administrators road maps to where security might be breached on their networks.

Internet Scanner can also check for *spoofing*, a popular method of gaining access to a network through its firewall by which an unauthorized host emulates an authorized one. Internet Scanner is capable of finding the security holes in Windows 95 file sharing as well.

Many security breaches are internal, so keeping your network safe from in-house users is just as important as protecting it from hackers. Conveniently, Internet Scanner can also be used as an internal auditing tool, thereby allowing you to check machines on the corporate network

Scanning is time-consuming and can generate both network and host traffic. Therefore, if you are planning to run a network scan, be sure to do so when network traffic is at its lowest.

To test Internet Scanner, we installed the HP-UX version of the product on an HP Apollo Workstation running HP-UX 9.03. The product also comes in IBM AIX, SunOS, Sun Solaris versions. A Windows NT version is in the works.

The application came in a compressed-file format, which we uncompressed, and installed in a matter of minutes. Our test network had a firewall, which was running on a Sun SPARC 20. The firewall served as our interface to the rest of the machines in the network, which included a Windows NT server as well as a Windows 95 client.

Internet Scanner includes an easy to use GUI that simplifies both scanning and creating filters. For those of you with Unix, many of these tasks can also be done using the command line if you're operating on a Unix workstation that doesn't have a graphical environment. We even found creating re-ports to be easy with this product.

All of the security holes we created on our test network, which were improperly configured NFS and FTP servers, were found by Internet Scanner.

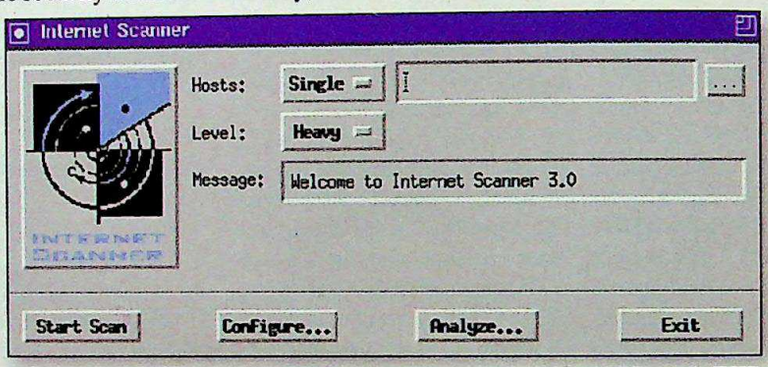
If you're running on Unix, don't worry. The product also has an option that allows you to scan all possible Unix ports, such as Finger, Rlogin, and Rsh.

As for pricing, Internet Security Systems offers an extensive range, depending on how many nodes you have on your network. To get an idea of what Internet Scanner would cost your organization, head to ISS's Web site.

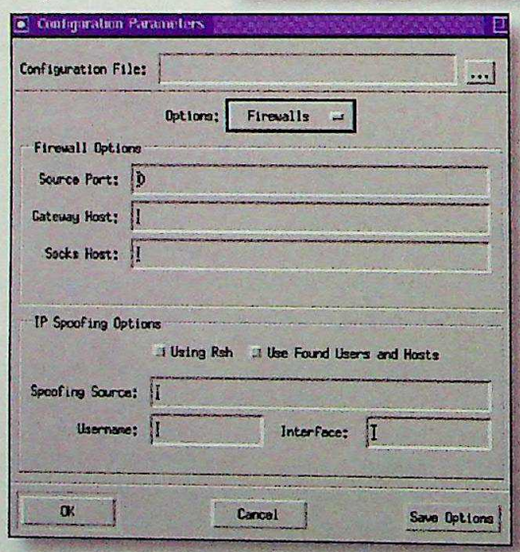
If you're a network administrator concerned about security, consider investing in Internet Scanner. It's an essential tool for helping you better understand both external and internal network security problems.

Internet Scanner 3.2. List price: $800 to $20,000 (pricing available on Internet Security System's Web site). Internet Security Systems Inc., Atlanta, GA. *(No Indian partner.)*

Additional testing for this review was provided by Michael Surkan of PC Week Labs.



SEARCHING: *Internet Scanner lets you determine the level of scan you want.*

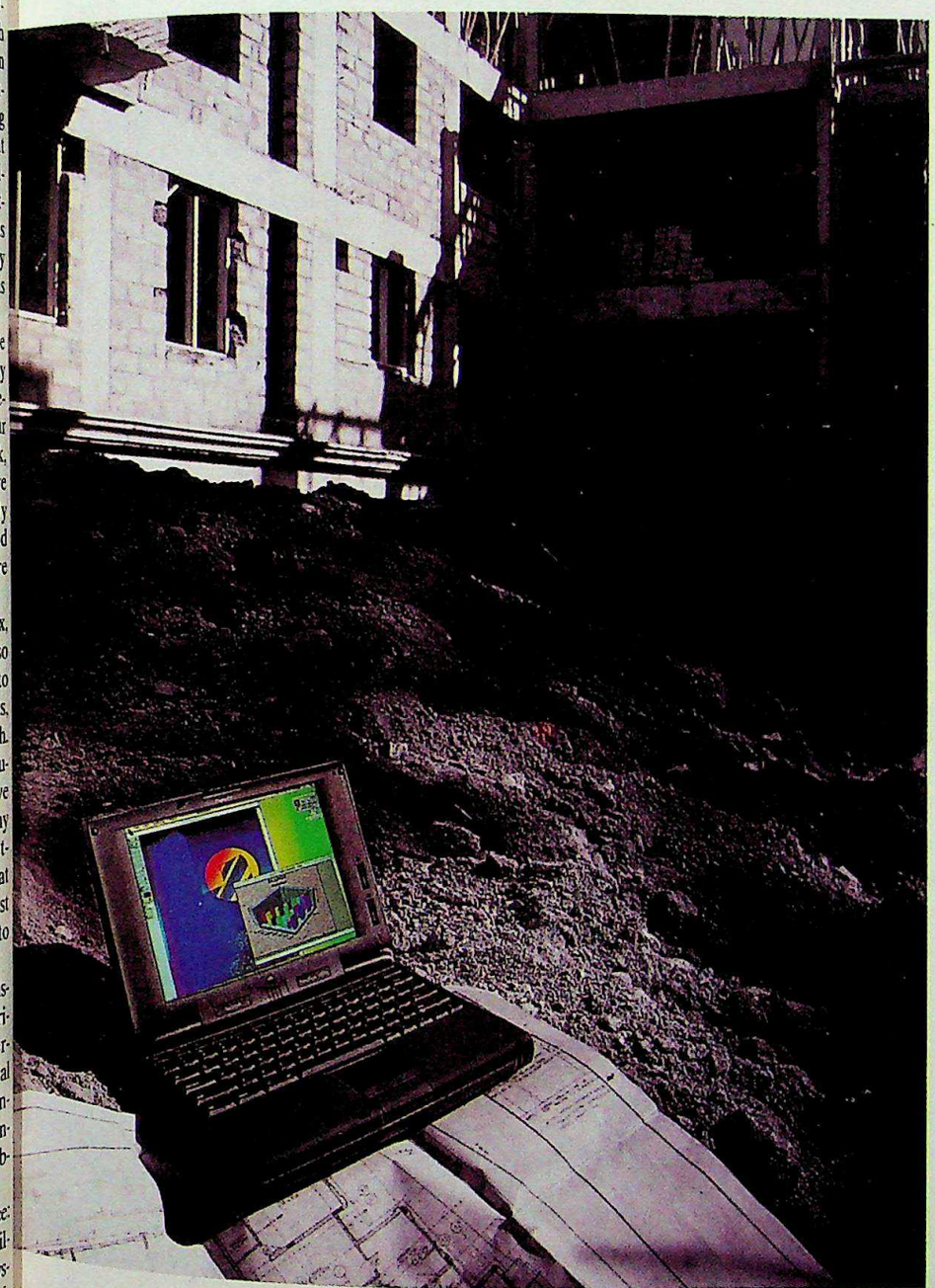


OPEN FIRE: *You can both scan your firewall and check for spoofing with Internet Security Systems' Internet Scanner.*

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Open Windows. Outdoors.



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SWITCH-MONITORING DEVICES

Madge Hits Switch-Monitoring Home Run

By Russell Iwanchuk

Imagine how hard it would be to coach a baseball team if instead of being able to view the whole field with all your players in position, you could see only one player at a time. When monitoring a switched network, you run into a similar difficulty because, unlike in shared networks, you can only see one port at a time.

If you're running a Madge or LANNET MultiNet switch, however, you're in luck. Madge Networks has just come out with a solution: SMONMaster, Version 1.0 ($3995). SMONMaster is a network management suite that allows simultaneous high-level RMON views of Ethernet, Fast Ethernet, FDDI, and Token Ring network traffic passing through your switch. To use SMONMaster, you will also need Madge's monitoring probe, the NMA-RS ($7995) and its MultiMan network management software ($3995).

SMONMaster gives you a bird's-eye view of your network, providing such graphical statistics as which hosts on the network are communicating and how much, which ports see the most traffic and at what time of day, and whether any ports are reporting error packets. This just isn't possible with any other switch-monitoring software.

But why monitor activity on your switch? For starters, pinpointing problems, such as a slow network connection, can be difficult without an overview of switched traffic. The ability to monitor and analyze network statistics from all ports at once or to get an idea of traffic trends can be the key to optimizing limited network resources and improving performance.

The unique architecture of the Madge switch is what makes SMONMaster's capabilities possible. Many switches use a fast CPU to do the switching and so any diagnostics or monitoring activity that goes on will cut into the CPU time and cause some performance degradation. Madge uses a 1.28-gigabit-per-second Cellenium bus that handles all switch traffic, and all of the switch's modules (Ethernet, Fast Ethernet, FDDI, Token Ring, and, most recently, ATM) plug into it.

This architecture has two advantages over traditional CPU-based switching. The first is that, since all traffic must use the Cellenium bus, it must all flow through one central place in the switch. This allows for simultaneous rather than port-by-port monitoring of all traffic. The second advantage is that, since switching and monitoring aren't vying for the same resource, you can constantly monitor the switch without degrading performance.

SMONMaster gets its information from the NMA-RS monitoring module, which is SMONMaster's tap into the Cellenium bus. SMONMaster has two versions: one running in IBM's NetView and the other under Hewlett-Packard's network management platform, OpenView (with present-day support for both the Sun and HP Unix versions and future support for the Microsoft Windows version).

We tested SMONMaster on a Sun SPARC5 with SunOS 4.1 and HP OpenView. Once SMONMaster is installed on your workstation, you plug the workstation and the NMA-RS module into the switch, launch MultiMan and SMONMaster, and start monitoring.

SMONMaster appears as a small window with buttons that correspond to its seven tools. Cellenium Bus Statistics is the first tool you should use; it provides a good overview of traffic trends.

The other tools give you a more detailed picture. Port Statistics, Port Top N, and Extended Port Statistics all report information about ports on the switch, individually or by group. And Port Statistics presents details in the form of a graph, showing the numbers of packets per polling time for each port.

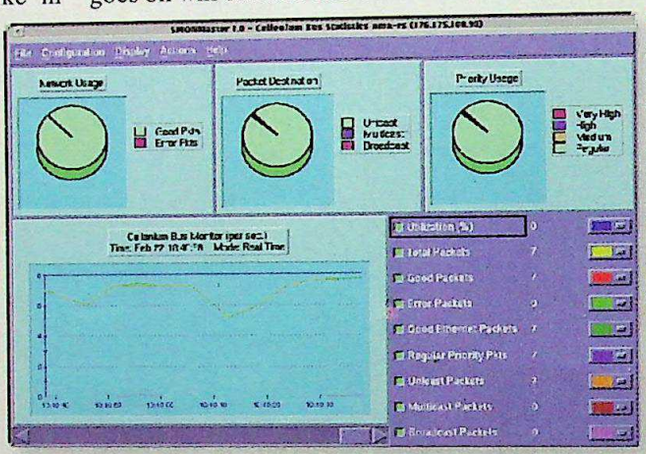
Host Matrix, Host Statistics, and Host Top N display information about the hosts at the other end of the cable. Host Statistics can show the kind and quantity of packets each host is transmitting.

Host Matrix shows a matrix of which hosts are communicating with one another, including the rate of packets sent. This information is filterable, so you can have SMONMaster display only the data that you're interested in.

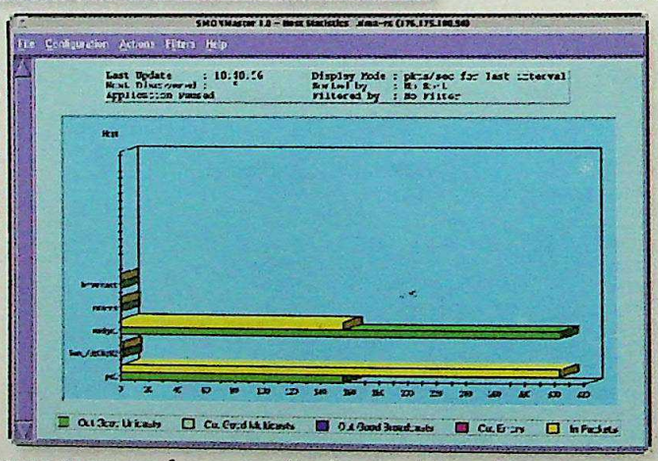
If you've done your math while reading this review, you may come to the same conclusion we did: Purchasing SMONMaster, MultiMan, and the NMA-RS module isn't exactly a cheap way to go. But your $16,000 will buy you unparalleled switch-monitoring capabilities that other vendors would do well to consider implementing.

SMONMaster, Version 1.0. List price: $3,995; MultiMan, $3,995; NMA-RS, $7,995. Madge Networks Inc., San Jose, CA.

(Indian partner Godrej Trading, Plant 19A, Pirojshahnagar, Vikhroli, Bombay 400 079. Tel 5171166; Fax: 5170415.)



STATS: *To get an excellent overview of network traffic trends, use Cellenium Bus Statistics.*

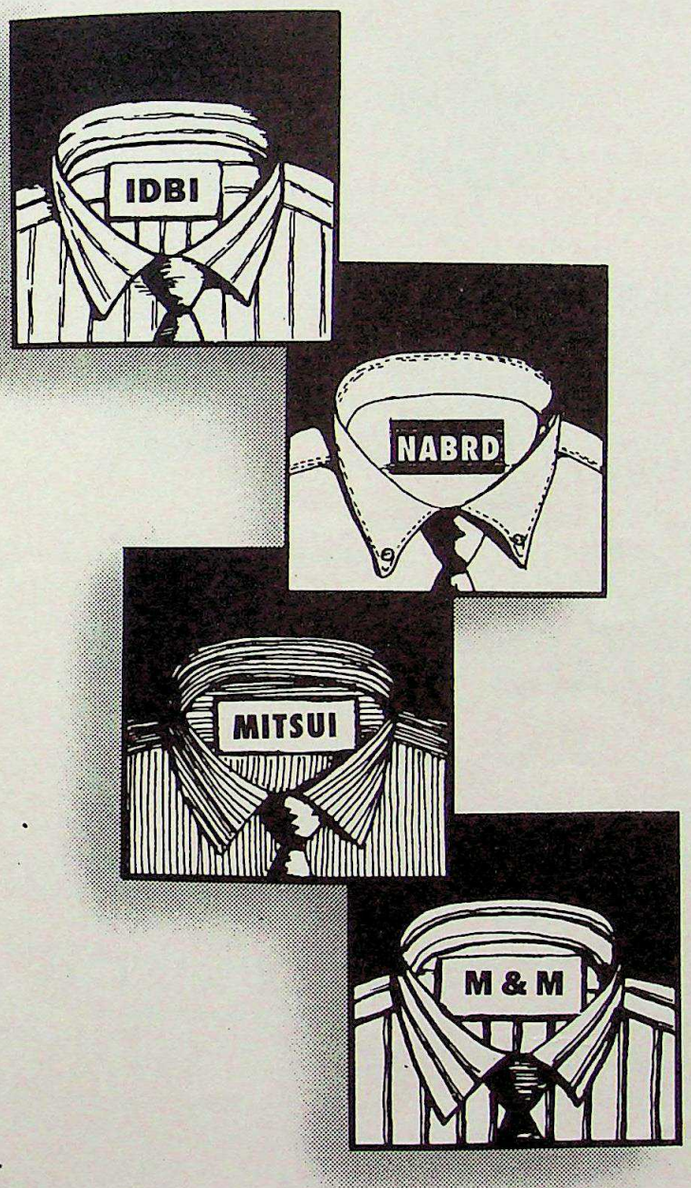


HOSTING: *For the kind and quantity of packets each host is transmitting, run Host Statistics.*

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BILL HOWARD

My Top 20 Questions

Have you ever found yourself stymied while working at your computer because the hardware or software simply couldn't do something it really ought to? I'm not talking about features that would require breakthrough technology, for the most part.

Rather, a little common sense and solid design principles could go a long way in the computer industry. Here are 20 "how come" questions I'd love to pose to computer vendors. As in, "How come your product doesn't. . . ?"

1. Why don't $2,000 telephony PCs come with a blinking message-waiting light? It's a 99-cent part found on most $49 answering machines. By the way, does anyone actually use the PC's answering machine?

2. Why can't we have smart cut-and-paste that knows enough to revert smart quotes, dashes, and other special characters (“, ”, or —) to something simpler that can be transmitted by e-mail programs?

3. Why isn't there a Windows successor to Lotus Magellan, the lightning-fast file indexer and viewer that is one of the 10 best utilities of all time?

4. Why can't ink jet printers be mounted on the wall to save space, the way toaster ovens mount under kitchen cabinets?

5. When will vendors label the switches and ports of PCs, printers, and scanners in English rather than confusing icons? Can anybody actually see, let alone comprehend, the beige-on-beige relief molding inside your ink jet printer that supposedly shows you how to change cartridges?

6. When will vendors of consumer appliances, VCRs, microwaves, and so on include electronic (disk-based) versions of the user manuals that you could store on your PC's hard disk? How many of your appliance manuals could you locate if you had to today?

7. Why is Microsoft's Briefcase so obtuse?

8. Why can't Windows 95 networking be more friendly to infrequent network users? Why, for instance, couldn't it look around at boot-up (and maybe every 15 minutes thereafter), determine if other PCs or laptops are attached, and if so, automatically attach the devices and their drive mappings without any fuss? But if other devices are not there, why can't Windows 95 let it be? Don't send those multiple messages that read, "The following error occurred while connecting F: to \\LAPTOP\C: Permanent connection not available." Earth to Win 95 : Does the computer name *laptop* give you a hint of why it might not be there all the time?



NO SATISFAXION

Will PC-based faxing ever work? Reliably and repeatedly, I mean.

9. When will we see system buses faster than 66 MHz?

10. Will PC-based faxing ever work? Reliably and repeatedly, I mean. When you send a fax from a fax machine, you know it's going to go through. With a PC fax, you have about a 75 percent chance of getting through. That's not good enough.

11. And when it does work, why does a fax take twice as long to transmit on a PC as on a fax machine?

12. When will we see four-color ink jet printer/fax machine combinations? Lexmark's three-color Medley is a nice idea, but it's not quite enough.

13. Why does Version 2 of Rand McNally's TripMaker require a CD-ROM at all times? Version 1 didn't. Don't the developers want you to be able to use it on your laptop while traveling?

14. Why have kids' games gotten so preachy? If one step in a camping game requires cutting a tree for firewood or shelter, must the game always remind us first about deforestation, old-growth forests, and not messing with spotted owls?

15. Why do some games that run from your hard disk still require the CD at start-up? Isn't that just a form of key-disk copy protection?

16. Why has it taken makers of ink jet printers a decade to enable banner printing, which we finally have on the excellent, cheap new HP 680 series?

17. Why aren't the outlets on surge suppressors and UPSs spaced far enough apart so you can insert transformer bricks without covering two outlets?

18. Why don't modem, printer, and miniscanner vendors spend a few extra dollars to integrate the power supplies into the units? (Answer: They don't want to be bothered with certifying them for safety and emissions.)

19. How hard would it be to label the foam packing pieces "top left," "bottom right," and so forth? Some of us do repack our PCs, monitors, and printer boxes.

20. Why is it that so many Microsoft apps (Office and Bookshelf, for instance) bypass the Windows 95 interface and use their own always-on-top floating-menu bars? Memo to Microsoft : There's a difference between *important* and *self-important*.

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The HP Reseller of the Year Award 1994 goes to Godrej for its unmatched marketing efforts and nationwide after-sales support.

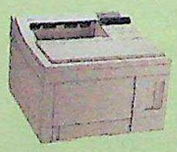


The HP Reseller of the Year Award 1995 goes to Godrej for its unmatched marketing efforts and nationwide after-sales support.

Some things never change.



HP DeskJet 660 C



HP LaserJet 4 Plus

We've done it again. Hewlett Packard Reseller of the Year, two years running. Rated the best in marketing efforts, innovative schemes, sales volume, countrywide branch and dealer network, and after-sales service, among all the HP distributors in India. Which means, one year later, Godrej is still the best place to buy HP products from. After all, who'd want to get off a winning track?

HEWLETT PACKARD Reseller OF THE YEAR '95 Godrej

HEWLETT PACKARD

Godrej Pacific

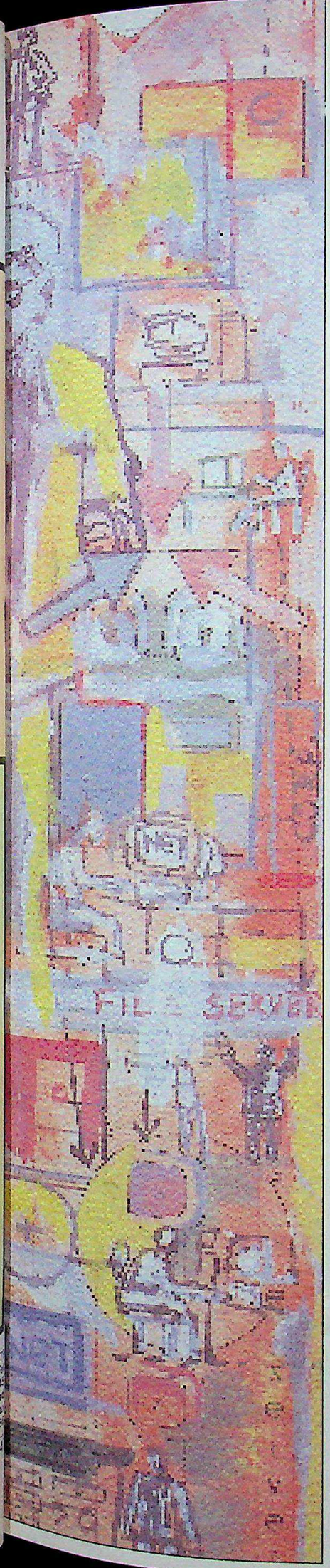
Fire-power for winners.

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CORPORATE INTRANETS

The Web Within

Corporations are using internal Web servers to give employees easy access to corporate information. But how do intranets measure up to legacy groupware applications?

By Leon Erlanger

No doubt you've surfed the World Wide Web to get information from all over the planet. But what about the mysterious world of information inside your own organization? You know what you're looking for is there, but it is widely dispersed and stored in a number of different file formats, printouts, and e-mail messages. And there is probably no organized way to access it.

A number of companies are setting up internal corporate Web sites, or *intranets,* to give employees easy access to mountains of corporate information. In a corporate intranet, the familiar Web browser becomes something close to a universal client: It can access a variety of back-end files and databases via the corporate Web server. And a number of home pages serve as hypertext links to all kinds of documents and data.

The corporate intranet is also an excellent platform for groupware applications. Vendors are working on products that will let your employees use your internal Web for group discussions and other collaborative tasks.

In this three-part feature we attempt to answer a number of questions: What is a corporate intranet? What types of functions can you use it for? How does it compare with legacy groupware platforms?

We also test and review a number of collaborative and document database products that you can link to your corporate Web server. And we provide a primer on how to set up your own Web within.

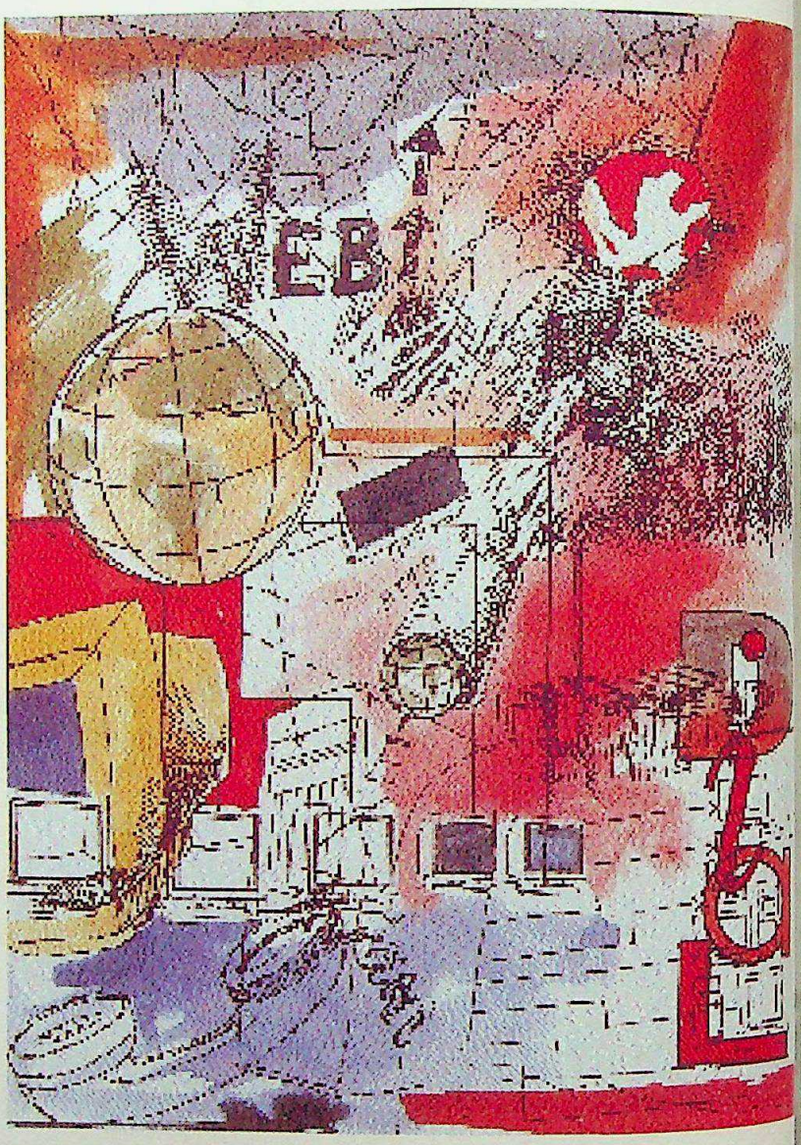
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A Universal Client?



The corporate intranet has become an entire application platform with a single client: the Web browser.

By Frank J. Derfler, Jr.

In the past few years, hundreds of entrepreneurs have produced a tidal wave of programs, procedures, and tools for the Internet. The powerful technologies that have resulted, including Web browsers, Web servers, the hypertext markup language (HTML), and the hypertext transfer protocol (HTTP), have made it easy for diverse Internet sites to share all kinds of information.

But the use of Internet technologies does not have to be limited to a worldwide information platform. Increasingly organizations are realizing that the same technologies that can stand up to the beating of the Internet can also be used to create a powerful corporate information and collaboration system, popularly referred to as an *intranet*. In fact, according to Zona Research, a market-research firm located in Redwood City, California, revenues in 1998 from the sale of Web servers for intranets will be four times those for the Internet. Software developers will certainly find more revenue in programs for intranets than for the worldwide Internet.

INTRODUCING THE INTRANET

The intranets springing up today generally consist of internal corporate Web servers made available to employees across the LAN or through private dial-up access. Through links to corporate databases, file servers, and document repositories, Web servers bring diverse kinds of information to employees via a single front end, the familiar Web browser. Employees use their Web browsers to access a series of corporate Web page with links to corporate documents and data written in HTML. Increasingly products are also appearing to give intranets group discussion and other groupware features.

Business writers and market analysts have long been singing the praises of companies such as Domino's Pizza, Federal Express, and Nordic Track, which flatten and lubricate their corporate structures by

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Corporate Intranet Strategies and You

By Frank J. Derfler, Jr.

The makers of groupware platforms and operating systems were busy focusing on one another with new product introductions when the Internet/intranet gang, led by Netscape and Sun Microsystems, burst in and started changing the rules. Suddenly we have a powerful new information platform based on World Wide Web technologies that is operating system–independent and owned by no one. And it's catching on faster than anyone expected, with new applications appearing almost daily.

The big boys may have been caught unaware at first, but they have changed their strategies to accommodate the Internet platform. Each of them wants to make sure that it retains or improves its market position as a result. Meanwhile, we have new players making important contributions and even some old players that we haven't heard much out of for a while.

What will the Internet/intranet look like after another year of head-butting by these corporate giants? Keeping in mind that 12 months is several years of Internet life, we can predict links to the Web from most applications and operating systems. You'll see Web browsers embedded in your favorite applications, and ways of accessing and in some cases manipulating your application files from your favorite Web browser. Popping in and out of the Internet or the corporate intranet to pick up a piece of information will become as common as working with your word processor. And your company's Oracle or Sybase database will take on new life through the ease of use a Web-browser client provides.

Templates and authoring tools will enhance the eye-appeal of the average Internet and intranet site. Java, OLE, and other technologies promise new interactive applications.

Is a dedicated Internet terminal in your future? We think probably not. If the Internet terminal or Internet PC is going to be any kind of success, it will only be because companies develop a different sales model. The cellular telephone model applies: Contract for a year of service and we'll sell you the terminal for $500 (or any other price the competition demands).

The clashes between Sun on one side and Microsoft and Intel on the other, and between Netscape and Microsoft, will be the major sounds heard in the Internet/intranet markets. Sun equipment and software powers the majority of World Wide Web and ftp sites, and Netscape has perhaps two thirds of the browser market. Microsoft wants to make both Sun and Netscape irrelevant.

Will Sun and Netscape win or lose their battles with Microsoft? Probably a little of both. Browsers like Netscape Navigator and hardware like the Sun SPARCserver will probably stay at the high end, but both companies will cede the middle and low ends of the market to Microsoft. This means that Microsoft's browser and Web server will be good enough for a majority of the installations, including much of the intranet market. But multimedia sites will benefit from the proprietary features Netscape's products provide.

Here we outline the corporate strategies of some of the big players and their implications.

	Strategy in a Nutshell	Method	Implications
Netscape Communications Corp.	Own the browser and Web-server Markets. Grow the browser as a new corporate desktop environment.	Give away beta software Stay on the technical leading edge. Provide APIs for developers of Internet applications. Integrate Collabra Share Partner with everyone.	Netscape's product line may end up being a principal platform for Internet-based applications. But it can expect very tough competition from Microsoft.
Microsoft Corp.	Keep people using Microsoft applications and operating systems. Make Windows NT the Web-server platform of choice.	Give away free Web browsers. Provide Internet Information Server free with Windows NT Server. Establish links to all Microsoft applications from the Web.	Microsoft will own a big piece of the Web-server market. You'll be using your Microsoft software together with your intranet for years to come.
Lotus Development Corp.	Make Notes the premier Internet document-publishing and collaboration platform for large corporate users.	Provide Notes Navigator and InterNotes Web Publisher free with Lotus Notes 4.0. Lower the price of Notes while building on its advantages over intranets.	Companies already using Notes will probably stay with it. Companies in need of a comprehensive groupware platform will take a close look.
Sun Microsystems Inc.	Prevent loss of server market share to Intel and Microsoft. Find new markets through Java.	Market Java heavily. Partner with everyone.	Java will most likely spur a new category of interactive applications. Sun-based Web servers will be important at the high end of the market.
Oracle Corp.	Drive the Internet/intranet to sell more client/server platforms.	Develop dedicated Internet workstations. Educate developers on Web-to-SQL links.	You will undoubtedly be accessing your corporate database via your Web browser.
Novell Inc.	Still here.	Buy the NetWare Web Server NLM. Integrate browsers into GroupWise.	The future for Novell as a player in corporate intranets is uncertain.

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linking employees with existing groupware packages such as Lotus Notes and Novell's GroupWise. The popular groupware products offer collaboration through threaded discussions and information distribution through document databases. But groupware systems can be expensive and cumbersome to install and manage. During installation, you struggle to accommodate the different hardware and operating system combinations of your numerous clients and the various network protocols in your organization. Then you have to develop a cadre of trained maintenance and support people who can handle the arcane commands and tricks of the proprietary groupware package.

By contrast, intranets are relatively inexpensive to install and administer. Web browsers are available free or almost free from numerous vendors, including Microsoft, Netscape, and Spry. Inexpensive or free Web-server software can also be found at numerous Web sites and even come packaged with operating systems such as Windows NT Server (see "Setting Up Shop" in this story). And the corporate intranet provides an information layer that is essentially independent of the operating system—anyone running on just about any network or desktop operating system can access information on the corporate Web server with the same browser they use to surf the World Wide Web.

Since employees use their familiar browsing tools, you avoid the training and support burdens that come with proprietary groupware client programs. You can instead focus your in-house software development work on important business functions. Employees stay with one comfortable application for a variety of functions ranging from searching databases to entering sales reports to sending e-mail.

The one hidden expense of setting up a corporate intranet is that you must run TCP/IP (transmission control protocol/Internet protocol), the protocols that define how information is passed around the Internet, on your network. If your organization runs on TCP/IP now, then you've paid the price for more memory and new software in desktop PCs and more capable routers throughout the network. Your network administrators have learned the tricks and traumas of setting up IP LAN software and assigning network addresses.

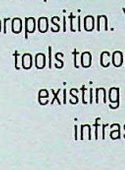
If you don't want to adopt TCP/IP fully, then you can use TCP/IP gateways from companies such as Firefox and Performance Technologies. These devices translate between TCP/IP and Nove IPX (Internet packet exchange) or N BIOS and reduce many of the proble associated with bringing TCP/IP onto corporate LAN.

If your intranet system is success you might incur a secondary cost in configuring your LAN to accommoda busy Web server. You might create a s net with the Web server, document-d base server, and remote-access server together on the same network segm This strategy keeps intranet traffic off cables carrying orders, inventory, other bread-and butter data.

The person in charge of the intra system needs practically the same skil the administrator of the small LAN. some rudimentary graphic-arts skills the ability to handle both HTML TCP/IP. The PC Tech/Power Progr ming tutorial in our issue of Decembe 1995, provides an excellent overvie

Intranet Thumbs-Up, Thumbs-Down

While intranets have certain obvious advantages, they also have weaknesses. Deciding to adopt an intranet should not be an all-or-nothing proposition. You can use Web tools to complement your existing information infrastructure.



An intranet is an excellent **platform for publishing** information internally.

The **ubiquitous Web browser** is available for virtually every client OS—unlike proprietary groupware clients, which may not be available for some platforms.

Web servers **don't need as much hardware** processing power and hard disk space as such classic groupware packages as Lotus Notes.

The market for Web server software is competitive—**not a single-vendor solution.** But the products interoperate well.

Web technology is scalable and can be used across wide area networks.

New authoring tools in desktop application suites make it **easy for novices to create HTML** pages for Web servers.

Collaborative applications for intranets are not as powerful as those offered by traditional groupware.

You have to set up and maintain **separate applications** such as e-mail and Web servers, instead of using one unified system as you would with a groupware package.

Limited tools exist for linking a Web server to databases or other back-end applications.

Intranets require a **TCP/IP network,** unlike other groupware solutions that will work with your existing LAN transmission protocols.

Intranets include **no built-in replication** for remote users, while packages such as Lotus Notes do.

HTML is **not powerful enough** to develop client/server applications. Programming standards for the Web, such as Java, are just emerging.

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the process involved in creating HTML pages. As the capabilities of an intranet grow, skills such as database administration, advanced graphics arts, and telecommunications management quickly come into play. Employees like learning how to design and maintain Web systems because, unlike many groupware systems, the skills are transferable and portable.

WHITHER GROUPWARE?

Do intranet technologies have the potential to displace well-known groupware systems such as Lotus Notes and Novell GroupWise? Given the flood of entrepreneurs working on new products, they do. But the issue is not necessarily groupware *versus* the intranet. Traditional groupware packages, notably Lotus Notes, are providing sophisticated intranet links that can bring their unique advantages to intranet collaboration.

One great advantage of traditional groupware products, at least today, is their ability to do *replication*. A remote Notes user can dial in to a Notes server, grab mail and documents, run for an airplane, and read it all at 35,000 feet. She can even make changes to documents and compose e-mail messages in the air, and, depending on her access rights, the information will be updated on the Notes server the next time she connects. At the same time, Notes servers at several locations can continually update each other to make sure that the databases on each are the same. Intranets do not yet offer this sophisticated technology.

Also keep in mind that to get all the capabilities of a powerful platform such as Lotus Notes for your corporate intranet will probably require stringing together numerous products from many different vendors. You may find that this ends up being as expensive as or even more expensive than using one comprehensive groupware platform and that making all these products work together is more trouble than you bargained for. Indeed, many of the Web-linked document-databases and discussion products

GLOSSARY

An Intranet Glossary

CGI (Common Gateway Interface) A standard that allows Web servers to run external applications such as search engines.

Collaboration software A network-based application that lets participants share information.

Document database An organized collection of related documents.

Firewall Hardware or software that restricts traffic to a private network from an unsecured network.

FTP (File Transfer Protocol) An Internet protocol that allows a user on one host to transfer files to and from another host over a network.

Groupware A network-based application that lets users collaborate.

Home page The first page of a Web site or of a logical group of HTML documents.

HTML (HyperText Markup Language) The language with which World Wide Web documents are formatted. It defines fonts, graphics, hypertext links, and other details. HTML is an implementation of SGML.

HTTP (HyperText Transfer Protocol) The protocol that negotiates document delivery to a Web browser from a Web server.

Hypertext A way of presenting information in which there are links from one document to another. In a Web document, the link is a URL pointing to another Web page or other resource.

Intranet A private network that uses Internet software and standards.

ISAPI (Internet Server API) A Web-server programming interface for back-end applications developed by Microsoft and Process Software Corp.

Java An object-oriented language, developed by Sun Microsystems, for writing distributed Web applications.

NNTP (Network News Transfer Protocol) A protocol for posting and retrieving news articles on Usenet newsgroups.

NSAPI (Netscape Server API) A programming specification for Netscape's Web servers to access back-end applications.

ODBC (Open Database Connectivity) An interface developed by Microsoft to let clients access multiple database engines.

Perl An interpreted scripting language, typically used in writing CGI scripts.

Replication The process of synchronizing data stored on two or more computers.

SGML (Standard Generalized Markup Language) A standard for defining and managing the structure and format of electronic documents.

S-HTTP (Secure HTTP) An extension of HTTP for authentication and data encryption between a Web server and a Web browser.

SQL (structured query language) A standard language for requesting information from a relational database.

SSL (secure sockets layer) A transport-level technology for authentication and data encryption between a Web server and a Web browser.

TCP/IP (Transmission Control Protocol/Internet Protocol) The collection of transport and application protocols used to communicate on the Internet and other networks.

URL (Uniform Resource Locator) A standardized character string that identifies the location of an Internet document.

Web browser Client software that requests and displays HTML documents and other Internet or intranet resources.

Web server A server that stores and retrieves HTML documents and other Internet or intranet resources using HTTP. Also called an *HTTP server*.

Workflow A set of formal rules for a specific process (such as billing) that are defined to improve efficiency.

World Wide Web The Internet's worldwide, HTML-based, hypertext-linked information system.

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we tested were priced at several thousand dollars and proved difficult to install and configure.

If you're in a large organization looking for a powerful platform to do a variety of functions from group discussions to document publishing to workflow, you're still probably better off today with traditional groupware. But you may want to save money by bringing many of your users in through Web browser connections. If you're willing to start small and you can wait a few months or years, there's a raft of new groupware-related intranet products that are sure to come, and prices are sure to fall.

THE NEW APPLICATION PLATFORM

The most obvious way to start using a corporate intranet is to post HTML-formatted documents on an internal Web server. The tools to create HTML documents or convert documents from other file formats to HTML are inexpensive and easy to use.

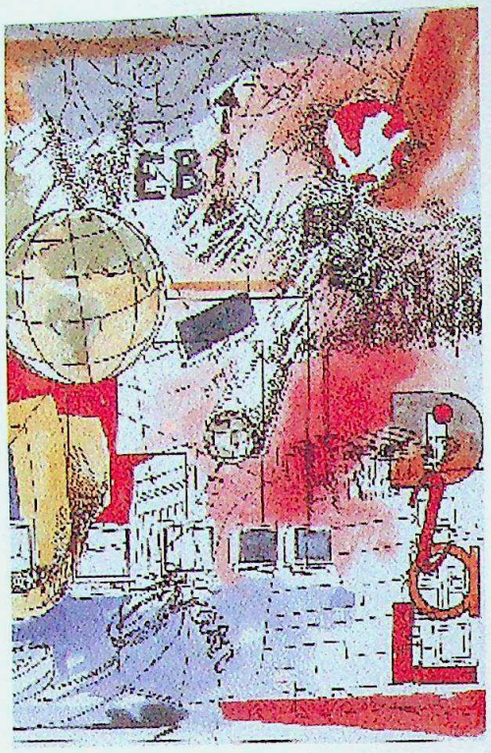
But manually translating files into HTML or creating HTML documents from scratch is not the only way to provide content for your internal Web server. We found a number of products available today that you can use to give your intranet a variety of powerful features. Our reviews in the section "Content and Collaboration" concentrate on products that provide group discussion tools and document databases to a Web browser.

We tested products from Digital Equipment Corp., Lundeen & Associates, Microsoft, and net.Genesis that interface with your Web-server software to let intranet users carry on threaded discussions via their Web browsers. We found that while they don't measure up to legacy group-discussion platforms such as Collabra Share and Lotus Notes—they tend to lack the searching, formatting, graphical, and file attachment capabilities of these programs—they work, and improvements will undoubtedly result from upgrades and new products on the market. Digital's Workgroup Web Forum is a standout product in this category.

We also examined add-in products from Electronic Book Technologies, Folio Corp., Information Dimensions, and Lotus Development Corp. that provide access to flat-file document databases via your Web browser. Each of these document database products still serves anyone using the existing proprietary client software, but now people can get information through browsers too. These products work by automatically converting information from their proprietary file formats to HTML, often on the fly as the information is requested. Again, we found that with current products, the Web-browser client lacks some bells and whistles found in the proprietary client programs, such as multiple window frames, address books, and online help. And some of the Web-conversion products were extremely expensive—as much as $25,000 for the software alone—diminishing their allure as low-cost solutions.

We think that many companies will take advantage of the threaded discussion Web-server products, since they are easy to install and use, and relatively inexpensive. Installing a corporate-wide document database, however, is a more strategic decision involving preparation and planning across many departments. T intranet server link into a document da base is more likely to be an adjunct t standard workgroup installation.

While we found some excellent pro ucts that are available right now, our search also turned up significant produ from Attachmate, Microsoft, and oth companies that are about to be releas (see the sidebar "Intranet Beta Watch



What's New Online

From April 8 to 12, join Frank J. Derfler, Jr., senior networking editor at *PC Magazine,* and executives from Lotus, Microsoft, and Netscape on the Web for a discussion on intranets. Go to our home page at *http://www.pcmag.com* and select Discuss on the navigation bar.

CORPORATE DATABASES: THE SQL

Things can get a lot more complex if y want to use your intranet server to acc searched and sorted database records namically in SQL or other formats. your organization has substantial p gramming expertise, you can create ap cations conforming to the common g way interface (CGI) specification t links the Web server to corporate da bases. Programmers fluent in C++, P Unix shell scripting, and Microsoft Vis Basic will find ways to hook into the W server software.

But this market isn't standing still. M crosoft, Oracle, Sybase, and many sma companies are working on programs t automatically extract data from corpor databases and convert it to HTML do ments on the fly as the data is reques (see the sidebar "Query the Web").

We even found two workflow pr ucts—Action Technologies' Acti Workflow Metro and Ultimus's W Flow—that can be accessed via W browsers (see the sidebar "Workflow the Web").

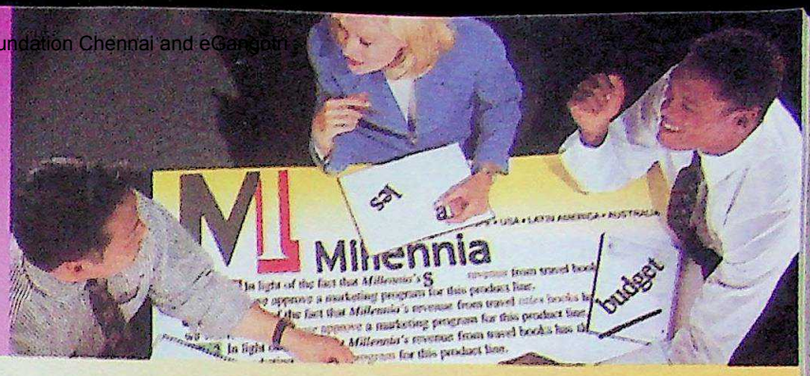
THE SECURE WEB

Intranets provide the good things of Internet without the risks of invasi Hiding your corporate network behi firewall with Internet connections is putting a high wall around your city w ceding the highways and harbors to barbarians. But building a private tranet accessed across the LAN through a dial-up remote-access ser that you run is like living on an island doesn't appear on any maps. And can protect it with private phone n bers, modems that dial back pre- grammed numbers for authorized u and close control over the unique sta addresses on the LAN. The barbar never even see you.

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WORD IS OUT...
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...Why would PC Computing at Comdex /Fall 95 vote Word Pro 96 for the "Most Valuable Products Award?"

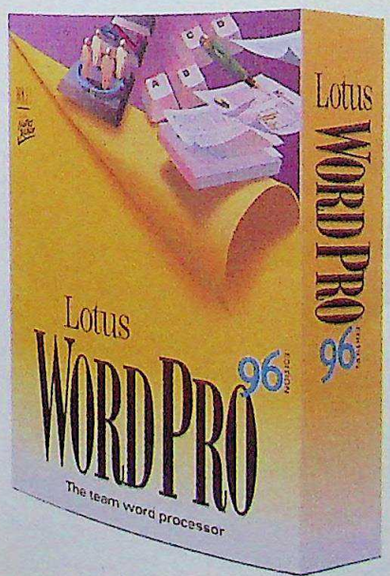
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Word Pro 96. on Windows 3.1, and Windows 95. Soon on OS/2

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Content and Collaboration

Products for accessing group discussions and gigantic document databases via a Web browser are here, but how do they measure up to their legacy competitors?

By Tony Pompili

It's déjà vu all over again. The wave of organizations setting up intranets today is reminiscent of the move from corporate networks to departmental LANs over the past ten years. But this time the driving force is not so much file-and-print sharing as it is easy access to corporate information. Intranets let organizations share information in nearly any form and help users find exactly what they need.

The intranet is also becoming a platform for group discussion. While Internet newsgroups have always provided opportunities for threaded discussions, software is now becoming available for creating threaded discussions on Web pages. Thus there is no need to set up an NNTP (network news transfer protocol) server in addition to your Web server.

For both information access and group discussion, the intranet competes with existing groupware platforms such as Collabra Share and Lotus Notes. The intranet's advantage: In most cases all a user needs is a Web browser. Recognizing this advantage, Collabra, Lotus, and other groupware platform developers are jumping on the intranet bandwagon, providing Web browser access to their systems. While Web browsers are either free or low cost, we found that some intranet products are quite costly—as much as tens of thousands of dollars.

REVIEW CRITERIA

We looked at two categories of products that will prove useful to most corporate intranets—group discussion packages and document databases. From the group discussion camp, we chose products that allow users or administrators to set up and administer discussions that can be accessed via a Web browser.

The resulting test group—which comprises Microsoft FrontPage, net.Genesis's net.Thread, Web Crossing from Lundeen & Associates, and Workgroup Web and Workgroup Web Forum (both from Digital Equipment Corp.)—bears a resemblance in features to our favorite legacy discussion products such as Collabra Share and Open Mind, and the group discussion features of Lotus Notes. The Web-based products we tested, however, did not prove to be as mature in power and ease of use as their legacy brethren, though they were fine as basic discussion

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tools. As we went to press, O'Reilly & Associates shipped WebBoard ($249; *http://software.ora.com*), a discussion product for CGI-compliant Windows 95 and Windows NT Web servers.

The other product group we tested consisted of document databases that provide access via standard Web browsers. These are useful vehicles for storing hundreds or thousands of constantly changing documents and letting intranet users easily search, sort, and retrieve the exact information they need. The products we reviewed—Information Dimensions' Basis Document Manager, Electronic Book Technologies' DynaWeb, Folio Infobase Web Server from Folio Corp., and Lotus's InterNotes Web Publisher—are really legacy information database products with links to Web browsers.

Netscape's much-anticipated Collabra Share-enhanced browser was not available for this review. Also, askSam Systems' askSam Web Publisher, Attachmate's Emissary Workgroup Emcee, Galacticomm's Worldgroup, Novell's GroupWise WebAccess, and Searchlight Software's Spinnaker Web Server were still in beta at the time of testing and are discussed in the sidebar "Intranet Beta Watch." As we went to press, we learned of OpenText Corp.'s Livelink Intranet Suite, which the company claims will include document-database, text-search, group-discussion, and workflow modules. It will be priced at $12,500 for the first module and $6,500 for each additional module. While Lotus Notes is famous for its group discussion capabilities, it is essentially a document database. For that reason, we chose to review Notes under our document database category.

GETTING ON THE WEB

All of the products we reviewed give you access from any standard Web browser. Only Digital's Workgroup Web, a discussion product for small workgroups, requires that additional software other than a Web browser be installed on each client. All of the packages—except Workgroup Web (but not Workgroup Web Forum), Folio Infobase Web Server, and DynaWeb—work with a variety of Web servers. Five of the nine packages we tested come with their own Web-server software, and Folio and DynaWeb come with their own single-purpose Web servers. Workgroup Web uses your existing network operating system, not a Web server.

COLLABORATION WISH LIST

In testing our group-discussion products, we looked for features that we're used to seeing in legacy discussion packages, but in many cases we looked in vain. All of the packages except Web Crossing let users view discussions in a threaded format—arranged by top with indented responses. But both Digital products require moving throu several screens in order to see respons to responses. And Web Crossing has threads; it arranges messages only chronological order.

Only Workgroup Web Forum offe participants multiple views (for examp by date) of message threads. And o Digital's products and Microsoft's Fro Page came with message-searching ca bilities. Finally, only Workgroup Web Web Forum allow file attachments.

Recognizing that groups want to li access to their discussions, we look at the security features of these produ Digital's Workgroup Web Forum h the best features, with document-, disc sion-, and page-level security for each cussion group. Web Crossing net.Thread give you discussion-level curity, and the more general-purp FrontPage lets you assign access to an tire Web site. Only Workgroup W Forum and net.Thread allow an admi trator to moderate discussions.

These products do not yet measure to legacy group discussion produ though they do what they do reasona well. Workgroup Web Forum, our E tors' Choice, comes closest to its leg competitors. It has file attachments excellent interface, and robust secur

HIGHLIGHTS

Intranet Products

You probably have the basic tools to deploy an intranet at your fingertips already: a Web browser and a TCP/IP stack. But transforming the homogeneous world of HTML and Web browsers into useful, interactive applications with which your company can run its business is a daunting task. Some of the products we reviewed provided powerful features and great ease of use; others left us wondering why we would get rid of our classic groupware packages.

Proprietary groupware looked very attractive compared with the slim offerings of some collaboration Web products. In many cases, the intranet products didn't provide the rich features to which we'd grown accustomed, such as attaching documents to a message or editing messages after they had been posted. Also, with some of the document database add-ons, the Web browser simply acted as a passive viewer: As with other broadcast media, information goes only one way. Finally, as you would have to expect with products that allow universal access, security for the Web-based products was more limited than we would have liked.

Ease of use was readily apparent with these Web products, but with some exceptions. We saw that, for the most part, Internet tools are getting better at shielding administrators and users from the character-based technology that underlies it all. "HTML programmer" will seem as quaint a moniker as "typesetter" as products get smarter and more graphical.

Interoperability is a necessary key in setting up an open intranet architecture; otherwise, you would be better off with a more powerful proprietary package. With one exception, each of the products we reviewed allowed any Web-browser client to access its services. Some products functioned as single-purpose Web servers and couldn't work with third-party HTTP servers. Some standards—such as the Netscape Server API and the Internet Server API—are already in place for building bette back ends.

The overall cost of an intranet system might be more than you expect. While the basic ingredients—Web browsers and servers, HTML authoring tools—are inexpensive, we found that the prices of some o the Web collaboration tools ran to the thousands of dollars. And that's not even taking into considerati the cost of training staff in the system's maintenanc and upkeep.

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Group discussion software:

Workgroup Web Forum

Document database software:

Folio Infobase Web Server

Information-sharing tools for the Web are proliferating. The best products we looked at give Web-browser clients the rich features you would expect from a typical Windows front end.

Digital Equipment Corp.'s Workgroup Web Forum is our Editors' Choice for Web-based collaborative software. Not only is Forum the most powerful collaboration system of the group, it's also one of the easiest to set up and manage.

Though the other collaborative tools are suitable for casual, ad hoc discussions, Forum has additional features that administrators are used to seeing in classic groupware products. Forum lets you password-protect individual documents, discussions, files, and home pages. It lets users view discussions in multiple views (such as by message author), and it has the most advanced searching features, including Boolean searches.

Forum's document-sharing features were unmatched as well. Documents can be uploaded to the Web server; only Digital's lower-end Workgroup Web includes a similar feature that lets users upload attachments to a shared server. Although Forum, at $1,995, is more expensive than the other products, it stands well above them in power, manageability, and user features.

For Web add-ons to document databases, our Editors' Choice is Folio Infobase Web Server from Folio Corp. Primarily a platform for publishing on CD-ROMs or electronically, the Infobase Web Server automatically and reliably converts Folio Views documents into HTML without any manual style-sheet coding. Of the products reviewed here, it was also the easiest to set up. Although browsing documents was more powerful with Folio's proprietary client, we found that the hyperlinks in Folio Views translated perfectly into HTML page links.

An honorable mention goes to Lotus's InterNotes Web Publisher. Going beyond browsing, the InterNotes Web Publisher lets Web users interact with Notes via simple HTML forms. InterNotes is easy to set up and use—although with some limitations—and, even better, the next version will be free to users of Lotus Notes Release 4.

WEB DOCUMENT DATABASES

All of the document-database products we tested are legacy products with the added ability to translate documents and text from their proprietary formats into HTML. In fact, all of the products except InterNotes Web Publisher do HTML translation on the fly in response to queries from the Web browser. InterNotes requires translation of entire databases or documents in batch mode before they can be accessed through a Web browser.

Each of these products also offers a proprietary client for non-Web users. In general, responses to Web-based queries were just a bit more sluggish than queries to proprietary clients, because of the extra time required for on-the-fly HTML translation.

Folio Views and DynaText come from the publishing world and are used primarily by publishers to distribute databases on CD-ROM or electronically. Basis WEBserver is an add-on to the powerful Unix-based Basis Document Manager. And Lotus Notes is a complete groupware platform with powerful collaboration, document management, and workflow tools.

One of the most important features we wanted to see for Web users was powerful search capabilities. All four products offered just that, with full-text search abilities including Boolean and nested searches. But the Basis Document Manager's WEBserver came out ahead with a Thesaurus Manager that enabled system administrators to link like concepts together.

Web clients provided buttons and hypertext links for basic navigation, but usually the proprietary client offered more robust navigation tools. We found that Infobase Web Publisher and Basis Document Manager gave their Web clients the most robust navigation.

System architecture was also important. Both Basis Document Manager and DynaWeb run their Web services on the included Unix Web-server software, which may be a bit intimidating for sites more used to traditional PC-based NOSs. Lotus Notes doesn't come with its own Web server.

Occasionally, you want the database to accept input from users. For example, you may want to create an intranet database that lets Web users register for an upcoming training class. Only Basis Document Manager and Lotus Notes were able to allow users to input information that would end up directly in their databases. On the development side, we were looking for products that could be configured for Web access easily. Infobase Web Server and InterNotes Web Publisher could create HTML pages with a minimum of modification, while DynaText and Basisplus required some work with style sheets to get the conversion working correctly.

In most cases the collaboration and document database products we saw reflect a promising start for intranet groupware applications.

GROUP DISCUSSION SOFTWARE
Microsoft Corp.

Microsoft FrontPage

ALL REVIEWS BY STEVE RIGNEY

As a group-discussion product, Microsoft FrontPage ($695), from Microsoft Corp., is meager. But as a general-purpose tool, it offers everything you need to set up and maintain your corporate Web. If powerful collaborative tools are your priority, look at Digital's Workgroup Web Forum; but if you want a complete solution for setting up a Web

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COLLABORATIVE SOFTWARE

How to Read the Suitability to Task Boxes

Installation and configuration are considered with the assumption that you already have a Web server installed. We expect these collaboration packages to work with most of the popular Web-server software packages. Documentation is weighed, too: How complete is it? We want a simple, graphical installation that requires little or no modification to the Web server. And since we expect the system to work with any Web-browser client, we consider whether proprietary client software is required.

Conferencing features should let Web-browser clients engage in multilevel threaded discussions. We consider how many levels of threading are supported and whether the user can choose multiple views of the discussion. The discussion interface should be intuitive, with straightforward toolbars and buttons—Web-browser clients shouldn't need a user manual. We also want some sort of indication of unread messages built into the product. Products that allow users to search messages and add formatted message text are given extra consideration. We look for the capability to insert URLs that point to other Web sites or files; extra credit is given if the product uploads attached documents and stores them on the server.

SUITABILITY TO TASK

Product name

	Power	Ease
Installation and configuration	Poor	Poor
Conferencing	Fair	Fair
Web mastering	Good	Good

Web mastering considers the level of customization and the ease of use of management features. We expect to be able to modify the look and feel of the discussion page, and we evaluate any tools that are included for HTML authoring. Basic features, such as the ability to remove or modify participants' posts, are considered, as are enhanced conferencing features such as real-time polling of users. Finally, we want to be able to set up access rights and passwords from within the product, instead of having to control access via the Web server itself.

site with some group discussion capabilities, FrontPage may be right for you.

FrontPage was originally developed by Vermeer Technologies, which was acquired this January by Microsoft. It includes both a 16-bit HTTP server for Windows 3.*x* and a 32-bit HTTP server for Windows 95 and Windows NT. (We installed FrontPage on Windows NT.) The server is very easy to install; the only information you have to provide is a user name and password. Microsoft also provides FrontPage server extensions that allow you to edit and maintain Web pages on other Web servers, including WebSite, from O'Reilly & Associates. At the time of this review, however, only the extensions for free Web servers (such as NCSA's) were final. You can download the extensions from Microsoft's Web site.

HEAT AND SERVE

FrontPage provides a unique feature called WebBots, which make it easy to create custom applications on your Web server. The 12 WebBots included with FrontPage are preprogrammed common gateway interface (CGI) scripts that let the Web administrator set up discussion groups, forms, search engines, or other services on a Web server.

SUITABILITY TO TASK

Microsoft FrontPage

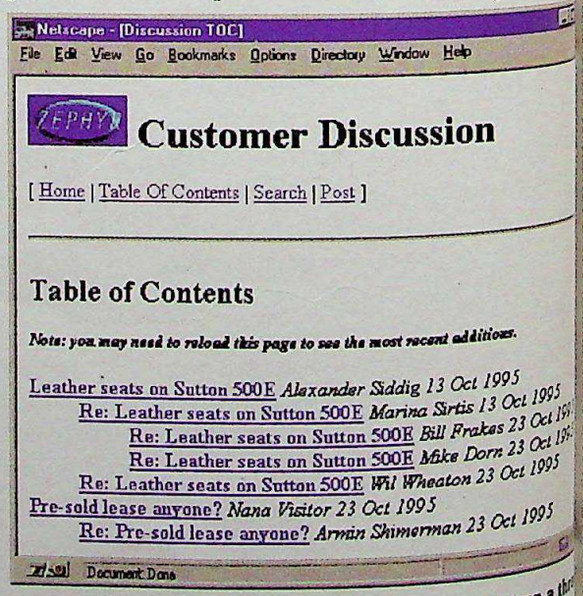
	Power	Ease
Installation and configuration	Good	Excellent
Conferencing	Fair	Fair
Web mastering	Fair	Good

To create a discussion group with the WebBot, you must choose to add a new Web and select the Discussion Web Wizard. Then you configure the Discussion WebBot parameters, including the name of the discussion and its location on the server. In the main view of a discussion you see all posts, with responses indented below.

After the page is saved and activated, other users can participate in the new discussion, create new topics, and respond to messages. Users have no restrictions on the number of responses to responses in the threaded discussion. Except for disk space on your Web server, there is also no limit on the number of topics users can begin. But FrontPage gives users no way to modify messages that have been posted, nor does it allow users to attach files to their messages. The product does not include any formatting tools either; all the messages are entered in plain text. And unlike Workgroup Web Forum, FrontPage does not give users multiple views (for example, by author).

One of the best aspects of the product is the full-featured FrontPage Editor. It allows ... Web administrator to create sophistic... ed Web pages without knowing HT... Everything you type or insert in a pag... automatically converted to HTML in ... background, though you also can cho... to view the HTML tags. The editor ... sembles a word processor and includ... formatting toolbar and a spell check...

Creating and maintaining the cor... rate Web is easy with FrontPage's W... Wizards and Web Templates. Similar... a Wizard in a word processor, the W... Wizards ask you a series of question... help you create your Web site. W... Templates are canned forms that an ...

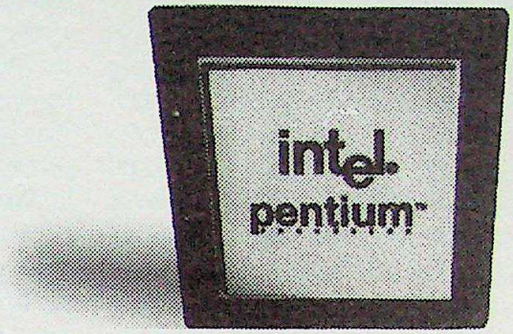


Microsoft FrontPage's WebBots feature lets you set up a th... ed discussion with a search option.

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ministrator can use to create common Web pages on all servers.

The FrontPage Explorer shows you multiple views of your entire intranet. The outline view in Explorer displays a hierarchical representation of your Web site. Different icons represent different pages, and Explorer even shows you the links between the servers and the pages. From the Explorer you also can set access rights to the Web server, but the security is not as extensive as Workgroup Web Forum's; you can only grant a user complete access to everything on the server or no access at all.

Microsoft FrontPage. List price: $695. Microsoft Corp., Redmond.

net.Genesis Corp.

net.Thread

Net.Thread 1.1 ($895 list price) provides basic discussion features, but it lacks such advanced features as file attachments and multiple message views. It was also the most difficult product in this roundup to install. Net.Thread, from net.Genesis Corp., works with any CGI-compliant Windows NT Web server that has the Perl scripting language. Like the other products reviewed here, with the exception of Digital's Workgroup Web, net.Thread is accessible from any forms-capable Web browser with no additional client software needed.

To create a discussion group, you have to log on as the net.Thread Webmaster. The Webmaster screen, which is password-protected, contains tools for editing new discussions, purging messages, and deleting threads. The Webmaster creates a new discussion group using a template. The Webmaster can modify the discussion form to add fields in plain text (such as "Type your message below"), but to add bold, italic, and underlined text, or graphics, you have to edit the HTML code manually.

A nice feature of net.Thread is the ability to set up a moderated discussion group. With this option, the moderator must approve messages before they are posted to the discussion and has the ability to alter the messages before they are posted. Participants can see if a particular discussion group is moderated before they join in.

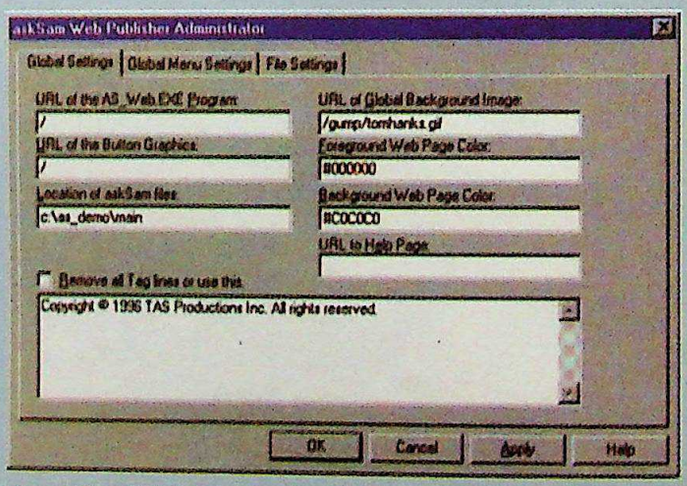
Intranet Beta Watch

By Tony Pompili and Steve Rigney

In the course of our review, we came across several vendors that were working on exciting intranet products that were still in beta. Here's a brief look at five products for sharing information on your corporate intranet.

ASKSAM WEB PUBLISHER

AskSam Systems is making its popular flat-file databases available to Web users with its forthcoming askSam Web Publisher. Using any CGI-compliant Windows NT or Windows 95 Web server, the Web Publisher translates askSam 3.0 or askSam 3.0 Professional data into HTML on the fly. The Web Publisher is expected to be shipping by the time you read this and will be priced at $1,495. (askSam Systems, 800-800-1997; http://www.asksam.com. *Circle 468 on reader service card.*)



The askSam Web Publisher lets you define global settings for documents that are converted to HTML from an askSam database.

EMISSARY WORKGROUP EMCEE

Attachmate, which acquired Internet software vendor The Wollongong Group last year, has integrated the two company's product lines in its Emissary Workgroup Emcee solution. Due to ship in May, the package will include the Emissary Workgroup Server and the Emissary Workgroup Web Gateway. (At press time, Attachmate had not yet announced pricing for the products.) You will be able to use Emcee to create group discussions on your Web server, send and receive e-mail and files, and protect your data with strong security options.

Emcee is basically a new version of Attachmate's OpenMind collaboration software that includes hooks to HTML and the CGI specification (for a review of OpenMind, see "Let's Talk," November 21, 1995). The Emcee server includes all of the same features of OpenMind, including e-mail, file sharing, server replication, and group discussions. The Web gateway, which should work with any CGI-compliant Web server, converts all of the database information from the Emcee format to HTML on the fly when a Web browser client requests the information. (Because the gateway will not translate rich-text format.) Attachmate is also planning to develop Emcee for Web servers with Microsoft's Internet Server API (ISAPI) and the Netscape Server API (NSAPI).

GALACTICOMM WORLDGROUP

BBS vendor Galacticomm has migrated to the Web. Unlike the other products outlined here, Galacticomm WorldGroup requires a client add-on to Netscape Navigator (with versions for other Web browsers coming in the future). You will be able to use WorldGroup, a set of client/server applica-

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SUITABILITY TO TASK

net.Thread

	Power	Ease
Installation and configuration	Poor	Poor
Conferencing	Good	Good
Web mastering	Fair	Fair

BARE THREADS

When users connect to the net.Thread discussion page, they are prompted for the depth of threads they want to view on the screen. For example, the default depth of threads is three, but you can increase that number if you want to view multiple responses to responses on the same screen. Net.Thread will also place the word "new" by every new message until an administrator-defined interval passes Unlike Workgroup Web Forum, the product offers no alternate views (such as messages viewed by author). The message entry screen is an HTML form that is not customizable by a user. Any message-formatting by the user must be done manually using HTML. As with FrontPage, users are not limited in the number of messages and responses they can post.

Installation was difficult. We found that documentation for net.Thread, which is also available for Unix, insufficiently detailed. In fact, the manual was written for the Unix version with only a short addendum for Windows NT. Additional documentation is available at the company's Web site though. We copied the files from a single floppy disk onto our Web server and then ran the supplied DOS-based Perl script that installed net.Thread. (In our testing, we used the version of Perl included with Netscape Communications Server.) After we answered all of the questions, we had to create a CGI directory path on our Web server and give it a URL name. After that, we were ready to set up our discussion groups.

Net.Thread has no security built in but, if the Web server supports it, the administrator can assign user passwords for access to specific pages. The name a user enters appears only as the author of a message and allows the Webmaster to track messages. Users can't delete messages or create discussion pages unless they log on with Webmaster rights.

Net.Thread is a viable solution if you just need to add simple threaded discussions to your Web server. But to enable document attachments in your discussions, collaborate across the Internet or your intranet.

The standard Worldgroup product—which is essentially a BBS—includes e-mail, group discussion forums, polls and questionnaires, file libraries, and live-chat features. The Worldgroup Plug-In for Netscape Navigator, expected to be available in April as part of Worldgroup 2.0 (priced at about $500), is a small application that launches when a user accesses a Worldgroup application embedded in a Web page.

GROUPWISE WEBACCESS

By the time you read this, Novell's GroupWise messaging platform will have added GroupWise WebAccess, programs that allows any Web browser to access a GroupWise in-box via the Internet or an intranet. (At press time, Novell had not announced pricing.) From the Web client, you will be able to send and receive e-mail, schedule meetings, and view files and faxes. The only difference between accessing GroupWise using WebAccess and the regular client is that you aren't able to store mail off-line except as separate HTML or text files.

WebAccess—which includes the WebAccess CGI/HTTP Module and the WebAccess Post Office Module—requires an existing GroupWise Post Office server and any CGI-compliant HTTP server. When Web users log in to WebAccess and request information, the data is converted on the fly to HTML. You can also use WebAccess with Novell's NetWare Web Server if you want to keep your intranet solution on a NetWare platform.

The WebAccess solution is great for users who want to send e-mail and check their schedules easily, but for an administrator it could require a lot of time to set up and to maintain.



The Worldgroup Plug-in for Netscape lets you access Galacticomm's BBS system over a TCP/IP connection.

SPINNAKER WEB SERVER

Searchlight has also adapted its BBS software for the Web. Spinnaker Web Server will allow you to publish information (including group discussions, e-mail, and files) from a Searchlight BBS to a CGI-compliant Web server, and vice-versa. And you won't have to be an HTML programmer; Spinnaker converts the data on the fly when a Web client requests it. In addition, you will be able to add CGI-based Web applications to Spinnaker Web Server. Available applications include a conference system, file library, databases, and a game called Webversi. The Spinnaker Web Server should be available for less than $500 by the time you read this.

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Workflow on the Web

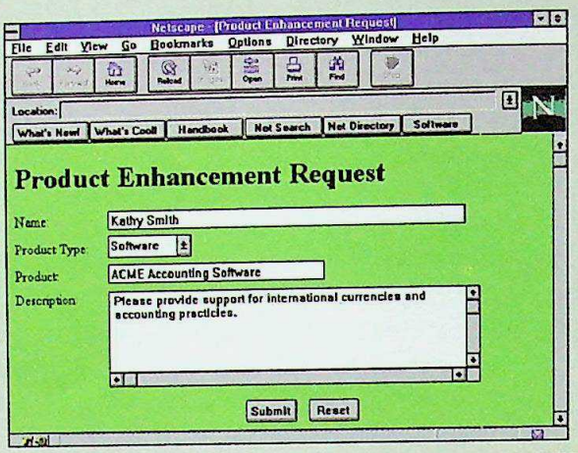
By Steve Rigney

In the main reviews, we look at the corporate intranet as a platform for creating group discussions and sharing data. When you apply the concept of workflow to the intranet, you may be able to get even closer to the goal of a paperless office.

Workflow refers to a standardized sequence of tasks which occur within a company and which have been established to improve efficiency. For instance, a common workflow application is a help desk: When a software company receives a technical support call from a customer, it usually has a standard procedure for entering, tracking, and resolving the question. Applications that automate workflow processes range from very loosely defined systems to highly rule-based systems. Companies that develop popular workflow products include Action Technologies, Lotus, Ultimus, and ViewStar Corp.

Two of these companies have Web-based workflow products: Action Technologies' ActionWorkflow Metro and Ultimus's WebFlow. Unfortunately, Action doesn't include an installation program for Metro and the company would not let us try to install it. In the end, we had to settle for a demonstration of Metro. Also, although we got a hands-on look at WebFlow, the product was in beta at the time of our review.

Metro is the more expensive product, but it provides a number of applications in a completely native Web solution, and its ability to track each step of the workflow process is powerful. Ultimus's WebFlow is easy to use and less expensive, but it only makes use of the Web for launching workflow processes, not tracking them.



With Ultimus's WebFlow add-on, any client with a Web browser can submit a workflow request.

ACTIONWORKFLOW METRO

The first thing you will notice about ActionWorkflow Metro is its price tag. The standard Metro Application Center package, which includes 20 workflow applications and unlimited user licenses, carries a $40,000 retail price (not including installation and training). Separately, Action Technologies also sells the $40,000 Metro Development Center, which lets you write custom workflow applications. Metro runs on Windows NT Server and requires Microsoft SQL Server and Netscape Commerce Server or Communications Server, none of which are included.

Why would you consider Metro, given its hefty price? As a native Web solution, it provides an easy way to let your customers and employees access workflow applications using any standard Web browser instead of a licensed client for each desktop, according to Action Technologies. Users outside the company can more easily participate in the workflow from any Web browser. Metro also includes 20 canned workflow applications, whereas Lotus Notes only has templates that need to be customized.

Metro allows any standard Web browser to become a full client to the workflow applications on the Internet or a corporate intranet. For example, an external client can submit a request for technical support via a Web site. That same customer could reconnect later to see the status of the request—whether it's been serviced, declined, or sent to someone for consideration.

In addition to the customer service workflow application, the Metro Application Center includes Web workflow solutions for sales, marketing, human resources, finance, and accounting departments. If one of the included applications doesn't suit your needs, you can buy the Metro Development Center.

ULTIMUS WORKFLOW STARTER KIT

The Ultimus Workflow Starter Kit with WebFlow sells $3,345. The package includes Ultimus's engine, WebFlow, designer modules, and five client packages. Whereas Metro uses an SQL database to route the various steps of a workflow, Ultimus relies on your existing e-mail infrastructure.

WebFlow, which generates e-mail based on requests from Web browsers, currently works only with MAPI-compliant e-mail systems, but the shipping version of the product should include support for vendor-independent messaging (VIM) systems, such as Lotus Notes and cc:Mail. WebFlow requires a Netscape Web server.

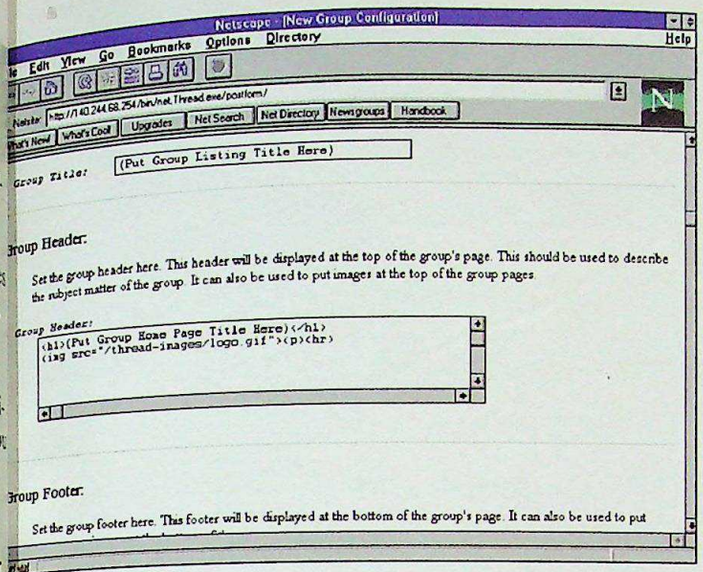
You can set up Ultimus WebFlow to allow anyone to initiate workflow action via a Web browser. But unlike Metro, Web users cannot track the workflow process (although Ultimus full client users can check a request's status and generate reports).

Ultimus is as easy as any standard Windows application to set up and configure. The WebFlow application is on just one disk, and the main Ultimus workflow program is on five disks.

The Workflow Starter Kit includes a forms designer and a graphical design interface that lets you define workflow rules. For Web users, WebFlow automatically converts the workflow forms to HTML. As long as you have an e-mail system installed and working, you should not have any trouble with the WebFlow setup.

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You need to format HTML manually to create a group discussion with net.Thread.

ons or to provide multiple views of the iscussion threads, Workgroup Web orum is a better solution.

et.Thread 1.1. List price: $895 (Windows T version). net.Genesis Corp, Cambridge, MA.

Vo Indian Partner.)

undeen & Associates

Veb Crossing

ike the other discussion products in this review, Web Crossing ($395) is a Web server add-on that allows you to eate easy-to-use discussion groups. But eb Crossing takes a different approach: ach conversation topic is presented in a ng, chronological list instead of as a readed series of messages and replies. his makes Web Crossing more of a oup forum product than a threaded dission utility.

Lundeen & Associates has a complete ided tour on its Web site that demonrates the features of Web crossing and cludes a sample discussion page. We commend that you take the tour before u start using the product.

Lundeen & Associates currently sells rsions of Web Crossing for Windows T Server and Macintosh servers (which ork with Netscape's Web servers), and e company is working on a Unix solun. We tested the Windows NT version. he product is fairly easy to install, but ocumentation is limited to a short HTML document. To install the product, the administrator copies the files to the Web server's hard disk and then launches the Web Crossing CGI script. The CGI script allows the Web administrator to set up discussion groups and add information such as users' names and the administrator's password.

After completing the installation process, you can start creating discussion pages. Web Crossing lets users register individual accounts, so that the server can track messages, telling each user which messages have been read and which haven't. Each participant must specify a user name and password; optionally, users can upload a picture and include e-mail and home page addresses. Web Crossing also gives the administrator the option of permitting guest access, which allows users to post anonymously and doesn't track which messages are unread. To participate in a discussion, click on the name of the group from the main discussion page and you see all of the participants and their messages.

Only the Web master is able to create a new discussion page (although any user can initiate a new topic on the page). This version of Web Crossing has no individual or group password settings; rights for general users are granted to all or none. Security for access to the discussion pages must be implemented through your Web server.

SUITABILITY TO TASK

Web Crossing

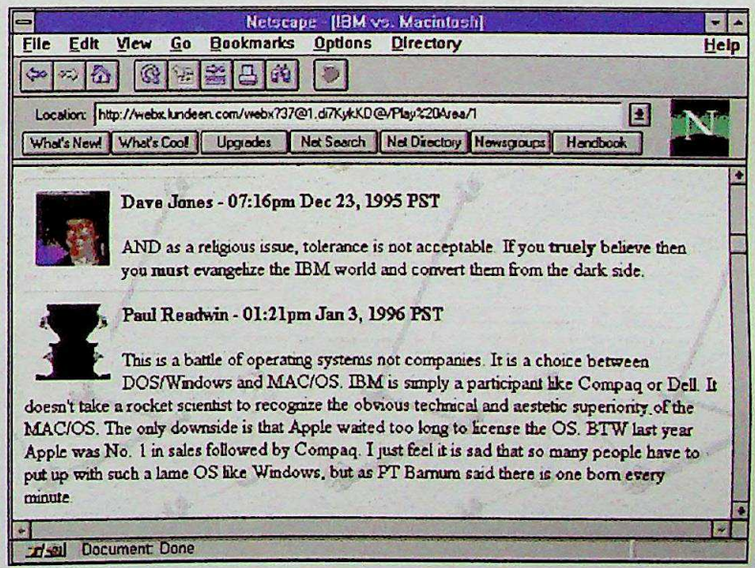
	Power	Ease
Installation and configuration	Fair	Fair
Conferencing	Fair	Fair
Web mastering	Fair	Fair

LAUNDRY LIST

One of the main drawbacks of Web Crossing is that it doesn't allow responses to appear directly under the messages they're responding to. You can only append a message to the bottom of the list. A useful feature, though, is the Web Crossing subscription feature, which lets registered users view only messages they have not read.

Similar to Workgroup Web Forum, Web Crossing includes several buttons on the discussion pages (Post, Edit, Add Topic, and E-Mail Sysop) that make it easy to create new messages. All of the messages are stored in a proprietary format, then translated to HTML on the fly when accessed by a user. Web Crossing offers a basic HTML editor that allows you to add bold and italic text as well as bullets, but you will have to enter HTML code manually if you want to attach a hot ink to a file or insert a graphic. Web Crossing lets participants edit messages up to 30 minutes after they're posted and delete their own messages at any time—something that no other reviewed product allows for every user.

Web Crossing will do the job if you're looking for the electronic equivalent of a



Web Crossing messages appear in a single list in chronological order, instead of as a threaded discussion.

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bulletin board, but if you need true threaded discussions and the ability to attach documents you should look elsewhere.

Web Crossing. List price: $395. Lundeen & Associates, Alameda, CA.
(No Indian Partner.)

Digital Equipment Corp.

Workgroup Web, Workgroup Web Forum



With good management features, easy installation, and powerful discussion tools, Workgroup Web Forum, from Digital Equipment Corp., was the best of the collaborative products we reviewed. Its lesser cousin, Workgroup Web is geared toward small workgroups that want to set up ad-hoc group discussions and shared folders on any network file server.

To access discussions, Workgroup Web users need a combination of proprietary client software from Digital and a standard Web browser. No web server is required. Intended for larger installations, Workgroup Web Forum ($1,995) requires a Web server and a TCP/IP network, but no client software other than a standard Web browser is necessary for accessing discussions.

WORKGROUP WEB

Of the products we looked at in this roundup, Workgroup Web ($99 for a single user, $799 for 10 users), was among the easiest to set up. With the basic Workgroup Web, you don't need to install a Web server or even the TCP/IP network protocol; you can use virtually any network operating system.

Although it works with any Web browser, Workgroup Web requires that users first install its version of Enhanced Mosaic 2.0 (licensed from Spyglass). To enable another browser for collaboration, within that browser you must associate the Workgroup Web extension (.WBL) with Digital's WGWEB.EXE program. After you do this, you are able to access the message-posting and searching tools, which must remain installed on every client. Workgroup Web was the only prod-

SUMMARY OF FEATURES

Collaborative Software

■ YES ■ NO
Products listed in alphabetical order

	Microsoft FrontPage	net.Thread 1.1	Web Crossing	Workgroup Web	Workgroup Web Forum
List price	$695	$895	$395	1 unit, $99; 10 units, $799	$1,995
Required RAM	12MB	Depends on Web server	4MB	10MB	20MB
Required hard disk space	16MB	100K	2MB	5MB	8MB
Includes Web-server software	■	□	□	N/A[1]	□
Works with third-party Web servers	■	■	■	N/A[1]	■
NOS Support					
Netware 3.x/4.x	□□	□□	□□	■■	□□
Windows 95/Windows NT	■■	□■	□■	■■	□■
Windows for Workgroups	■	□	□	■	□
Macintosh System 7.x	□	□	■	□	□
Sun Solaris	Optional	■	■	□	□
SCO OpenServer	□	■	□	□	□
OS/2 LAN Server	□	□	□	■	□
Digital Pathworks	□	□	□	■	□
Runs over TCP/IP, IPX	■□	■□	■□	■■	■□
Supported Browsers					
Microsoft Internet Explorer	■	■	■	■	■
NCSA Mosaic	■	■	■	■	■
Netscape Navigator	■	■	■	■	■
Proprietary client software not needed	■	■	■	□	■
Collaborative Features					
User can post messages	■	■	■	■	■
Threaded discussions:					
Allows responses	■	■	□	■	■
Allows responses to responses	■	■	□	■	■
Message content:					
Rich text/Graphics/Forms	■■■	■■■	■■■	■■■	■■■
Text/binary attachments	□□	□□	□□	■■	■■
Hypertext/URL links	■■	■■	■■	■■	■■
Opinion polls/Polling reports	■■	□□	□□	□□	■■
Types of searches:					
By database/topic/full text	■■■	□□□	□□□	■■■	■■■
Boolean	■	□	□	■	■
User can move threads within/ between databases	□□	□□	■■	■■	■□
Types of views:					
By thread order	■	■	□	■	■
By date	□	□	■	□	■
By author	□	□	□	□	■
Alerts user to new messages	□	■	■	□	□
Web authoring tools/templates provided	■■	□□	□□	□□	□□
MAPI/SMTP links	■■	□□	□□	□□	□□
User can modify messages after posting	□	■	■	□	■
Management					
Password protection	■	■	■	N/A[2]	■
Manager/user can:					
Set up discussion databases	■□	■□	■■	■□	■■
Assign access rights to individual databases	■□	■□	□□	N/A[2]	■■
Assign multiple levels of access rights	■□	■□	□□	N/A[2]	■■
Create custom templates	■□	■□	□□	□□	■□
Create custom buttons	■□	■□	■□	□□	■□
Manager can delete messages	□	■	□	□	□

N/A[1]—Not applicable: The product does not use Web servers. N/A[2]—Not applicable: The product uses existing NOS user rights.

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PROTECTOR PLUS ver 5.0

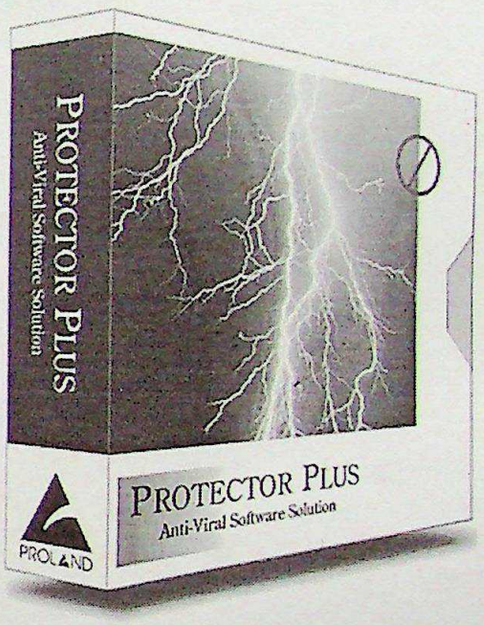
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The Webbed Suites

By Steve Rigney

Now that you've set up your intranet, and your users can share information using simple Web browsers, what do you do with your desktop applications? Maybe you need to upgrade them. Lotus, Microsoft, and Corel—which recently purchased Novell's PerfectOffice suite—have either added Internet hooks into the latest versions of their desktop suites or else plan to in upcoming releases.

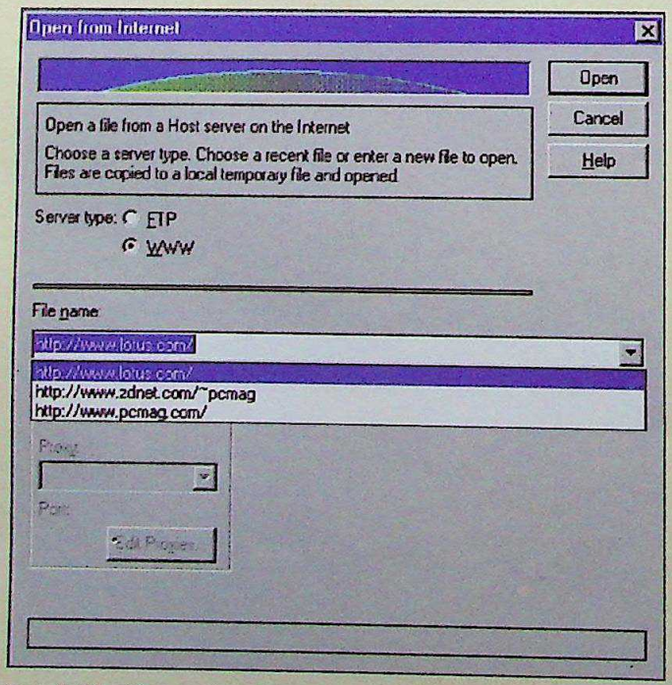
Many people prefer to compose and edit documents using their word processors, graphics programs, and databases. But users haven't been able to share or collaborate on those documents without having the same applications—and, in some cases, the same version. Here's a summary of how vendors are integrating Web software into their suites to make collaborating easier.

LOTUS SMARTSUITE 96

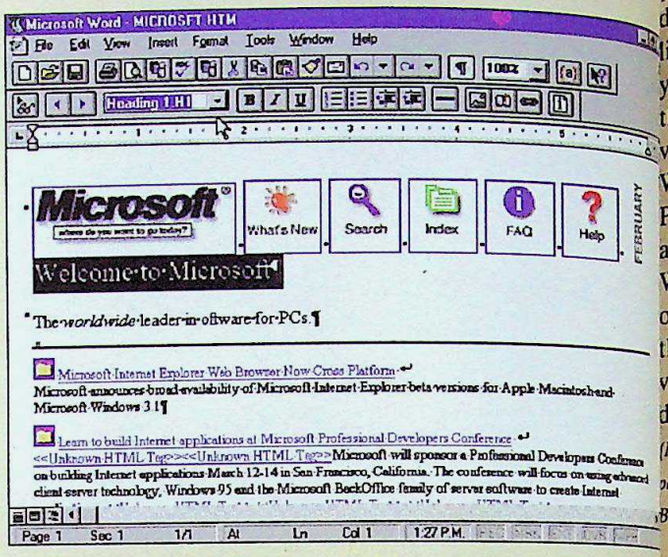
Lotus designed SmartSuite 96 for Windows 95 to allow users to access, share, and publish information across the Internet and a corporate intranet. With an optional Web browser, HTML editor, and a database of 500 Web sites, SmartSuite is definitely an intranet-ready desktop suite.

The most apparent Web hook in SmartSuite is the optional Global Network Navigator Web browser from America Online; it includes 30 days of free Internet connect time. From any SmartSuite application document, you can launch a URL by clicking a toolbar button. The Global Network Navigator browser is also available in SmartSuite 4.0 for Windows 3.1.

SmartSuite also includes an HTML editor for the WordPro word processor and for Freelance Graphics applications. You can use WordPro to edit and save HTML-based pages; WordPro's HTML tools are included in the shipping version of the suite. WordPro also lets you open Web and FTP URLs to function as a limited browser. Freelance lets you save presentations into linked HTML pages. You simply create a document using standard text and graphics, and SmartSuite automatically converts the information into HTML format. (Lotus Development Corp.) *(Indian subsidiary Lotus, New Delhi; Indian partner ITC, Calcutta.)*



Lotus's WordPro can function as both an HTML editor and a rudimentary browser for accessing FTP or Web sites.



Internet Assistant for Microsoft Word adds rudimentary HTML editing tools to Word.

MICROSOFT OFFICE FOR WINDOWS 95

Predictably, Microsoft has also added Internet and intranet tools to its Microsoft Office suite. The suite's applications have a software layer called DocObjects, and Microsoft is making available free Internet Assistants—fully integrated HTML editors—for Excel, PowerPoint, and Word. And for intranet users who don't have the suite, Microsoft offers free standalone viewers for each of the Office applications as well.

DocObjects—part of Microsoft's OLE 2.0 specification—are the most important pieces of Microsoft's strategy: These components allow your intranet and desktop applications to be aware of one another. For example, if you are using Microsoft's Internet Explorer to view a Web page and you come across a link to a Word document, the DocObjects technology automatically launches Word.

Microsoft also provides free Internet Assistants for Excel, PowerPoint, and Word so that you can save and edit documents in HTML. But unlike Lotus SmartSuite, these HTML tools are not currently included in the shipping product; you must either order them separately or download them yourself.

The free viewers for the Office

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applications will let you view and print Excel, PowerPoint, or Word documents. For example, if there is a link to a Word document on a page you are browsing, you can click on the document link to launch the viewer. Excel and Word viewers for Windows 3.*x* and Windows 95 and a PowerPoint viewer for Windows 95 are available now from Microsoft's Web site and online services. But only compared with the full apps do they look slim—the Excel and Word viewers each take up 3MB of hard-disk space. (Microsoft Corp.)

(Indian subsidiary Microsoft India, New Delhi; Indian partners Datapro Infoworld, Pune; Godrej Trading, Bombay; Sonata, Bangalore; TUL, Bombay.)

PERFECTOFFICE

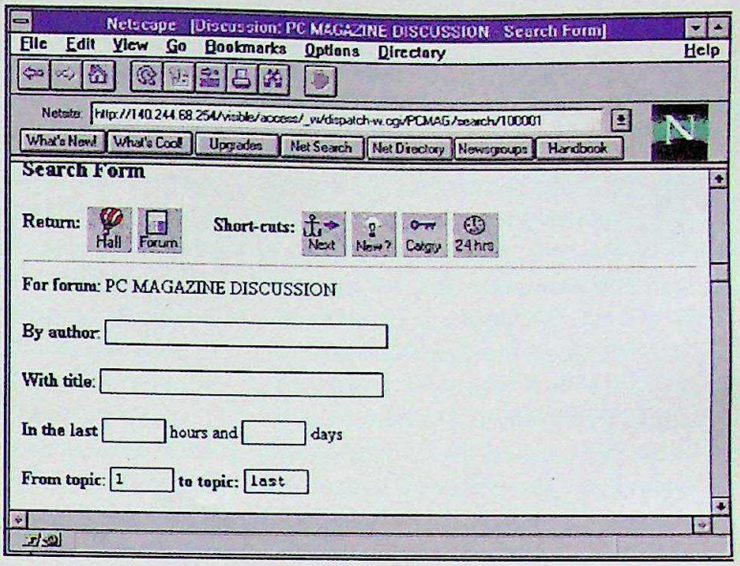
As we went to press, Corel and Novell announced the sale of most of the PerfectOffice suite to Corel. Novell retained ownership of GroupWise messaging and the Envoy portable document technology, which Corel will license to be part of PerfectOffice. Novell plans to have GroupWise WebAccess available by the time you read this, which will let a GroupWise user read and send mail from any Web browser (see the sidebar "Intranet Beta Watch").

In PerfectOffice 7, due to be released by the middle of this year, Corel plans to include several Internet tools. The suite will include Netscape Navigator 2.0, and each of the suite applications will include a URL linking capability to launch the browser when the user clicks on a Web address in a document. Both WordPerfect and Quattro Pro will be able to edit and save documents in native HTML, or save existing documents in HTML. Also, in Quattro Pro spreadsheets, users will be able to link formulas in cells to HTML documents. For sharing documents with non-PerfectOffice users, the free Envoy Viewer is available as a standalone application from Novell's Web site or as a Netscape Navigator 2.0 plug-in. (Corel Corp.)

(Indian partners Svam Software, New Delhi; Datapro Infoworld, Pune.)

uct we reviewed that requires any proprietary software in addition to the standard Web-browser client

After you have installed the client tools for Workgroup Web, using the product is simple. To start a discussion, the administrator must first use the Workgroup Web interface to define a discussion *folder*, which is an HTML file in a shared directory on the file server. Any user can then post messages and replies and insert pointers to documents in the existing discussion folder. The administrator can set up several discussions folders, and new users simply point their browsers to the starting HTML page (or file) in the shared directory. Although the discussions are threaded, you are able to view only direct responses to each message on a single screen (unlike net.Thread and FrontPage for Windows, which show multiple levels of responses on the same screen). Users cannot add bold or italic text formatting or any other fonts—Workgroup Web does not recognize HTML in the message fields.



Workgroup Web Forum's built-in search function lets you search all posted messages.

The standard interface of Workgroup Web consists of a toolbar with buttons for creating, posting, and replying to the messages. You can also search on keywords and phrases; Workgroup Web finds all of the messages that meet your search criteria and lists them on a separate Web page with hot links to the original pages. Users are not limited to the number of messages and responses they can post. But unlike Web Crossing, the Workgroup Web tools don't offer any way for participants to modify or delete their comments once posted.

Security for Workgroup Web is primitive. Since Workgroup Web uses the security provided by the NOS, any user who has the appropriate rights can manually alter any other participant's post. You can also delete messages that have been posted, but this will corrupt the links to that message from other messages in the thread. The only way an administrator can prevent users from changing or deleting files is to assign read-only access to the entire directory. And, unlike Workgroup Web Forum, there is no way to password-protect individual pages, files, or discussions.

In addition to the threaded discussions, you can use shared folders to post file attachments. If a user chooses to attach a file, the file is copied, in its original format, to the shared directory—a feature unique among the products we reviewed. Files attached in this manner, however, cannot be modified. If a user wants to attach a file and keep it updated, the user can insert an HTML pointer to a file that resides on a shared server. Unlike net.Thread and Web Crossing, you don't have to write an HTML hot link to link to files; you simply select the Add button from the toolbar and choose the file you want to include. You can also insert a URL for a direct link to a World Wide Web site if users have both TCP/IP installed and Internet access..

WORKGROUP WEB FORUM

While it has features similar to Workgroup Web's, Workgroup Web Forum does not require any proprietary client software, which means that any PC, Macintosh, or Unix forms-capable Web browser can use it. Forum runs as an add-on to an existing Web server and current-

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Query the Web

By Tony Pompili

Many businesses rely on database management systems (DBMSs) to store mission-critical data. As Internet technology gains a greater foothold in computing environments, vendors are responding with tools to link DBMSs to Web servers, providing more flexible access to corporate data. In the last few months, Computer Associates, Informix, Microsoft, Oracle, and Sybase have introduced a flurry of Web-to-database access products.

As you might expect, these vendors' products generally provide Web access to their own databases. But middleware products such as Allaire Corp.'s Cold Fusion Professional 1.5 ($495) are providing interoperable solutions. Cold Fusion lets developers create complex Web applications that can issue generic SQL queries to a DBMS. Programming features of Cold Fusion include conditionals, loops, and programmer-defined functions, as well as field validation.

But products developed directly by DBMS vendors can provide more direct access to database features. The basic architecture is the same for each of them: A Web-browser user enters static or dynamic SQL queries via HTML forms. Through API or CGI calls, the Web server submits the form to a DBMS agent, which converts the form into a database-specific SQL query. The database results are formatted into HTML and returned through the API or CGI gateway to the Web server and back to the browser.

Database king Oracle offers WebServer ($2,495 for Version 2.0; Version 1.0 is free with Oracle7), a group of applications—including an integrated HTTP server—that give Web-browser users live access to Oracle7 databases. The WebServer includes Oracle Web Agent and Oracle Web Listener for converting HTML forms to queries and sending result sets to the Web server. Additionally, WebServer HTML pages can point to Oracle7 PL/SQL procedures, giving developers access to existing libraries of procedures. As an extension to Oracle7 servers, the Oracle WebServer will offer added security with authentication and encrypted data streams.

Oracle also offers Developer/2000, a set of Web application development tools for its InterOffice multimedia and application workflow product suite. The product, which runs on Windows NT, Windows 95, and Macintosh clients, lets developers build Web applications that tap into InterOffice data and applications.

The Microsoft Internet Information Server—which at press time was free to download—includes the Internet Database Connector. This Internet Server API (ISAPI) application lets the Internet Information Server access an ODBC-compliant database (such as SQL Server) directly. Both Internet Information Server and SQL Server run only on Windows NT Server. SQL Server 6.5, in beta at the time of this article, is slated to include a feature for automatically converting database information into HTML.

Separately, Microsoft announced the Microsoft SQL Server Internet Connector license, which should be available by the time you read this. Priced at $2,995 per server, the license allows unlimited number of Web users to access an SQL-server database. (No software is included in the price.)

Sybase's web.sql ($1,200 to $1,500 per license depending on the network operating system and the number of processors) also gives developers HTML-to-SQL-database links. web.sql works with any Sybase database and can also work with third-party SQL DBMSs using Sybase's Open Client API and Enterprise Connect middleware products. With web.sql, developers embed SQL statements in HTML forms, which are then passed to a DBMS server. Sybase has announced a development suite, Optima++, for creating both client/server and Internet applications.

Computer Associates is aiming its Web product at commercial Internet sites in addition to intranets. CA-OpenIngres/ICE (Internet Commerce Enabled) generates dynamic HTML forms with SQL queries and includes a feature that lets an application notify a user when a specified condition has been met. CA-OpenIngres/ICE ($1,600) includes a Web server and built-in access security.

Informix is melding multimedia database technology with the Web. Expected later this year, the Informix Universal Server will support multimedia objects, such as images, sound, and video, as well as HTML pages.

SUMMARY OF FEATURES

Web-to-Database Connectivity Tools

■ YES ▒ NO
Products listed in alphabetical order

	Allaire Corp. Cold Fusion Professional 1.5	Computer Associates OpenIngres/ICE	Oracle Corp. WebServer	Sybase Inc. web.sql
List price	$495	$1,600	$2,495	$5,000
Platforms supported	Windows 95, Windows NT	Unix, Windows NT	Unix, Windows NT	Sun Solaris
Web server included	None	None	Oracle Web Listener	None
Gateways or APIs supported	CGI, ISAPI	CGI	CGI	CGI, NSAPI
DBMSs or standards supported	ODBC	ODBC, OpenIngres	Oracle7	OpenConnect, System 10, System 11
Includes HTML authoring tools	▒	■	▒	▒

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SUITABILITY TO TASK

Workgroup Web

	Power	Ease
Installation and configuration	Good	Good
Conferencing	Excellent	Excellent
Web mastering	Fair	Fair

SUITABILITY TO TASK

Workgroup Web Forum

	Power	Ease
Installation and configuration	Good	Good
Conferencing	Excellent	Excellent
Web mastering	Good	Good

ly works with Digital Unix, or Windows NT running either the NCSA, Netscape, or Process Software Web servers. The installation was simple for both operating systems. All you have to do is configure your Web server to point to the Forum HTTP pages.

Forum provides more searching options than the low-end Workgroup Web; they include a faster search engine and the ability to search using Boolean terms. And the group discussions are not limited to plain text; Forum supports HTML formatting, but you must add the codes manually. Like Workgroup Web, you can attach documents by uploading them to the Web server in their original format, and you can insert URL pointers to other Web servers.

A unique polling feature included with Forum makes it easy to tabulate group decisions. An administrator can gather and track responses to specific questions and even create a graphical chart to show how users have voted. All of the polling is done in real time.

In addition to the basic security from the Web server—you must have rights to access the Web server in order to even see the Forum page—Forum lets you password-protect individual documents, discussions, files, and home pages.

Forum offers a moderator feature, not available with Workgroup Web, that lets you choose which messages to post and edit users' replies. Another advantage of Forum is its ability to customize the user interface. Though the default interface offers the standard tools a user wants, you can also add new buttons and views. Unlike the other products we looked at, users can access discussions in any number of views, such as by author or by date.

While Forum is more expensive than Workgroup Web and requires both an HTTP server and a TCP/IP network, it provides an open solution with flexibility and manageability. Because of its more limited features, the quick and low-cost Workgroup Web is best for a small number of users.

Workgroup Web. List price: Single user, $99; 10 users, $799. **Workgroup Web Forum.** List price: $1,995. Digital Equipment Corp., Maynard, MA.

(Indian subsidiary Digital Equipment India, Digital Park, 92 Industrial suburb II, Yashwantpur, Bangalore 560 022. Tel: 3374785; Fax:3374701.)

DOCUMENT DATABASE SOFTWARE

Information Dimensions Inc.

Basis Document Manager

ALL REVIEWS BY TONY POMPILI

Basis Document Manager ($25,000), from Information Dimensions, is a powerful high-end information distribution system that runs on Unix. Like the other products we tested, the Basis WEBserver (included in the $25,000 bundle) provides access on the fly to the Basis Document Manager's document database from any Web browser, complete with rich text and graphics. But it goes a step further by giving Web users some interface enhancements and hypertext links not in the original Windows client. Only Unix users will be comfortable installing this product; however, Information Dimensions expects to have a Windows NT Server version by the end of the year.

Basisplus, a modified relational database system with a client/server architecture, is the core of the Basis Document Manager system. With Basisplus, Basis Desktop users can store and retrieve more than 200 document types (such as Lotus WordPro or .PCX) in their original formats. The Basis Desktop runs on Windows 3.1, and the server can run on multiple Unix systems although some database creation and maintenance tasks can be performed from the Windows client.

We tested Basis Document Manager,

DOCUMENT DATABASES

How to Read the Suitability to Task Boxes

Installation and configuration for these Web add-on products must be explained in clear and straightforward documentation, as well as in additional online help. The product should include an HTTP server that integrates smoothly with the document database, but we also like having the option to use the Web server of our choice. For configuring the system, the Web product should integrate smoothly with the existing document database without requiring the administrator to manually convert or copy files. Extra consideration is given if the product automatically converts the document databases into HTML without first requiring manual coding of style sheets. Finally, we want effective, integrated management tools for monitoring and updating the system.

Database accessibility addresses the functionality the products give to Web-browser clients. When accessing a document database via a Web browser, we want to have the same options as the system's proprietary clients. We consider what type of content does not get translated into HTML, as well as whether or not Web-browser clients have access to search features. We also compare the ease and power of the navigation features offered to Web clients with those available to the proprietary viewers. Although it is not mandatory, we also consider the ability of the system to support Web-browser input via forms.

SUITABILITY TO TASK

Product name

	Power	Ease
Installation and configuration	Poor	Poor
Database accessibility	Fair	Fair
Customization	Good	Good

Customization measures the tools and features offered by the products for modifying the look and feel of the HTML pages. We look at what tools are included to allow the administrator to configure the standard document formats as well as the default home page. We also look at any security tools (such as password protection for specific documents) provided to grant users and groups access to databases.

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Search and Sort Your Web

By Todd Spangler

You've set up an intranet with thousands of documents. Though surfing the World Wide Web can be an entertaining diversion for 12-year-olds, business users will get frustrated if they can't find what they're seeking. Search engines that work with Web servers let users quickly retrieve the information they want.

There are two basic ways to let Web clients search and retrieve data. One method is to provide a translation layer between an existing database and a Web server (see "Query the Web"). The other is to install a search engine that is designed to work with a Web server—either on the Internet or an intranet—and should not be confused with Lycos, WebCrawler, Yahoo!, or other Internet search sites (although Lycos plans to release a commercial version of its search engine later this year).

UNDER THE HOOD

Many search engines run as Common Gateway Interface (CGI) scripts. Every commercially available Web server is CGI-compliant, including those from Frontier Technologies, Netscape, O'Reilly & Associates, and Process Software Corp. (See "Setting Up Shop" for a chart of Web-server software and features.)

Several vendors—primarily Microsoft and Netscape—are also developing proprietary Web server APIs (application programming interfaces) to execute back-end applications more efficiently than CGI-based programs. The Netscape Server API (NSAPI) and Microsoft's Internet Server API (ISAPI) let add-on applications execute as extensions of the Web-server software itself—for example, as a dynamic-link library (DLL)—enabling tighter integration and better performance.

Some Web servers even include an integrated search engine, or are sold bundled with a search engine. Frontier Technologies and Quarterdeck both license Verity's Topic search engine as part of their Web servers. (The Topic search engine is also integrated into Lotus Notes Release 4 and will be part of Microsoft Exchange Server.) Open-Text's Livelink Search system ($12,500 and up) includes Netscape Commerce Server and Open-Text 5—the search engine behind the Yahoo! Web-wide search site.

The search engine you choose will depend largely on the platform of your network infrastructure and the type of data you want to search. Some sophisticated, higher-end tools—including Open Text 5, Verity's Topic Internet Server, and ZyIndex for Internet—can search multiple documents formats and rank results by relevancy. These products also include *spiders* (which automate document indexing) and can perform complex Boolean and concept-based searches. Some engines include preformatted forms to set up on your Web server and can translate proprietary formats into HTML on the fly. By contrast, freeware engines, such as CUI's htgrep, are sometimes little more than enhanced Unix search utilities.

Company/organization	Product name	Price	Platform	Document formats supported	Web address
Architext Software Inc.	Excite for Web Servers	Free	Unix, Windows NT	ASCII text, HTML	*http://www.excite.com/navigate*
EMWAC (European Microsoft Windows NT Academic Centre)	WAIS Server and WAIS Toolkit	Free	Windows NT	ASCII text, HTML	*http://emwac.ed.ac.uk*
Fulcrum Technologies Inc.	Fulcrum Surfboard	$6,250 and up	Unix, Windows NT	52 file formats including ASCII text, HTML, Microsoft Excel and Word, WordPerfect	*http://www.fulcrum.com*
InTEXT Systems Inc.	InTEXT Retrieval Engine	$7,500	Unix, Windows NT,	40 file formats including ASCII text, HTML, Microsoft Word, WordPerfect	*http://www.intext.com*
Open Text Corp.	Livelink Search*	$12,500 and up	Unix, Windows NT	40 file formats including Adobe Acrobat, ASCII text, HTML, Microsoft Excel and Word, SGML, WordPerfect	*http://www.opentext.com*
Pacific Coast Software	WebCatalog	$995	Windows NT	Tab-delimited text	*http://www.pacific-coast.com*
Personal Library Software	PLWeb	$4,995	Unix, Windows NT	Adobe Acrobat, ASCII text, HTML	*http://www.pls.com*
Tippecanoe Systems Inc.	Tecumseh	$3,995 (60 users)	Windows NT	ASCII text, HTML	*http://www.tippecanoe.com*
Verity Inc.	Topic Internet Server	$7,995	Unix, Windows NT	50 file formats including Adobe Acrobat, ASCII text, HTML, Microsoft Excel and Word, WordPerfect	*http://www.verity.com*
ZyLAB International Inc.	ZyIndex for Internet	$5,995	Windows NT	20 file formats including ASCII text, HTML, Microsoft Word, WordPerfect	*http://www.zylab.com*

*The product includes the Open Text 5 search engine and Netscape Commerce Server.

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Version L1G.2 and the Basis WEBserver on a Sun SPARCstation 2 running Solaris 2.3. The Web server software, which can be used as a generic Web server with other applications, is a licensed version of CERN's HTTP server. A Netscape Commerce Server version of the Basis WEBserver that supports the Netscape Server API (NSAPI) is expected to be ready by the time you read this. Installing the Basisplus database and Web server is not for Unix novices. The modifications necessary to the OS kernel will be confusing for the occasional Unix administrator.

WEB FRIENDLY

Accessing Basisplus information is far easier using the Web browser than with the product's Windows client. Besides using linked graphics and hot links for navigating through the database documents, the Basis WEBserver lets users execute dynamic searches; the Windows client doesn't. If a new document has been added since the search was last run, WEBserver automatically includes it in the result set.

On the other hand, the proprietary client, Basis Desktop, is hardly obsolete, since it is the main interface for database development and content administration. Basis Desktop users can submit documents in one of more than 200 file formats and retrieve them in their original formatting. The Basis Desktop client also includes ODBC drivers to connect to other data sources, as well as an API development toolkit to enable other products to access Basisplus databases. While you can use the Web client to input ASCII text, you cannot use it to import documents or graphics, nor can you retrieve documents with a Web browser in anything but HTML.

Since Basisplus documents are in a variety of formats, the company developed Markup and Style Guides to enable different types of clients to view them. Like DynaText's style sheets, Basisplus Style Guides convert documents on the fly into several other formats, including HTML.

SUITABILITY TO TASK

Basic Document Manager

	Power	Ease
Installation and configuration	Good	Fair
Database accessibility	Good	Good
Customization	Good	Fair

SUMMARY OF FEATURES

Document Databases

PC MAGAZINE EDITORS' CHOICE

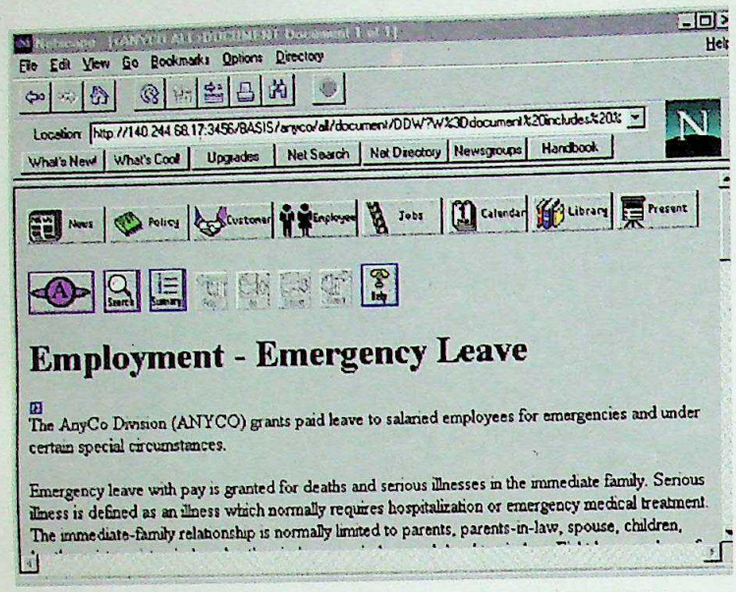
■ YES ■ NO

Products listed in alphabetical order	Basis Document Manager	DynaWeb 1.0	Folio Infobase Web Server	Lotus InterNotes Web Publisher
List price	$25,000	$22,500	$6,995	$3,647
Server Requirements				
Does not require a dedicated server	■	■	■	■
Required RAM/hard disk space	32MB, 200MB	2MB, 8MB	16MB, 10MB	48MB, 300MB
Includes Web-server software	■	■	■	■
Works with third-party Web servers	■	■	■	■
Server NOS Support				
NetWare 3.12, 4.1	■■	■■	■■	■■
Windows 95	■	■	■	■
Windows NT Server 3.51	■	■	■	■
Windows for Workgroups 3.11	■	■	■	■
Macintosh System 7.*x*	■	■	■	■
Sun Solaris 2.5/Sun OS 4.13	■■	■■	■■	■■*
SCO OpenServer	■	■	■	■
OS/2 LAN Server, Digital Pathworks	■■	■■	■■	■■
Runs over TCP/IP, IPX	■■	■■	■■	■■
File Formats Imported				
ASCII	■	■	■	■
Lotus 1-2-3 versions	Through 4.0	Through 2.0	None	Through 5.0
Microsoft Excel versions	Through 5.0	Through 4.0	2.1, 3.0, 4.0	Through 4.0
Microsoft Word for Windows versions	Through 6.0	Through 6.0	Through 6.0	Through 6.0
WordPerfect versions	Through 6.0	Through 5.0	5.*x*, 6.*x*	Through 6.1
.AVI/.WAV	■■	■■	■■	■■
FTP/NNTP	■■	■■	■■	■■
HTML/SGML	■■	■■	■■	■■
.PCX/.BMP	■■	■■	■■	■■
.RTF/JPEG	■■	■■	■■	■■
Web Browser Support				
Microsoft Internet Explorer	■	■	■	■
NCSA Mosaic/Netscape Navigator	■■	■■	■■	■■
Vendor provides browser	■	■	■	■
Web browser has live access to all databases	■	■	■	■
HTML conversion done on the fly	■	■	■	■
Proprietary client available	■	■	■	■
HTML-translated documents can contain:				
Text/Rich text	■■	■■	■■	■■
Structured data/Graphics	■■	■■	■■	■■
Sound/Video	■■	■■	■■	■■
OLE links/Hypertext links/Tabular data	■■■	■■■	■■■	■■■
Web Browser Search Features				
Search by database/topic/full text	■■■	■■■	■■■	■■■
Proximity/Boolean/nested search	■■■	■■■	■■■	■■■
Table of contents generated on the fly	■	■	■	■
Search results using Web client can be sorted alphabetically/by database/by relevance	■■■	■■■	■■■	■■■
Web Browser Editing and Navigation				
Add bookmarks/annotations/highlights	■■■	■■■	■■■	■■■
User can attach notes	■	■	■	■
Web-browser clients can navigate databases:				
By table of contents/index	■■	■■	■■	■■
Via PgUp/PgDn links	■■	■■	■■	■■
Management				
Manager can assign passwords	■	■	■	■
Manager can assign multiple levels of access rights	■	■	■	■
Manager/user can customize Web-page interface	■■	■■	■■	■■

*This product supports Sun Solaris 2.4.

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Basisplus gives Web browser users navigational buttons not available to users of the proprietary Basisplus client.

But creating the Style Guide for HTML conversion is an extra step that is not necessary with Folio Infobase Web Server and Lotus InterNotes Web Publisher.

Basis WEBserver is most useful if your company already uses Basisplus databases. System setup, database development, and maintenance take some Unix expertise. Unix sites will find the product appealing because the database server and Web server can reside on the same machine. Non-Unix shops will want to wait for the Windows NT versions of Basisplus and Basis WEBserver to consider this product.

Basis Document Manager. List price: $25,000 (includes Basisplus, Basis WEBserver, Netscape Commerce Server, and 10-user license). Information Dimensions Inc., Dublin, OH..
(No Indian partner.)

Electronic Book Technologies Inc.

DynaWeb

The DynaText electronic publishing platform, from Electronic Book Technologies, is building on its support for SGML to bring its databases to Web users via DynaWeb. DynaText offers powerful tools for turning just about any combination of existing documents into standardized DynaText "books." But like the other publishing platform reviewed here, the Folio Infobase Web Server, DynaWeb (sold with DynaText, which starts at $22,500) only lets corporate Web users view documents, not enter information. If you want to give users the ability to add information to the database, you'll have to give them the proprietary Windows client. And the DynaText system runs on Unix, so having at least some Unix experience is a prerequisite.

Like Folio Views, DynaText is a popular database used by publishers and CD database developers to distribute information. Its proprietary client, DynaTag, lets you automatically convert existing document formats such as Microsoft Word into DynaText's native format, Standard Generalized Markup Language (SGML). But while DynaTag is very powerful, the DynaText system provides no native authoring tools that you can use to create SGML content from scratch.

DynaWeb runs on a Unix system; we tested it on a Sun SPARCstation 2 running Solaris 2.4. The menu-driven installation was pretty straightforward, but getting databases up and running was another matter. Like Folio Infobase Web Server, DynaWeb is a single-purpose Web server used solely to convert DynaWeb documents to HTML.

UNIX WORLD

DynaWeb's configuration must be done directly in Unix. To make a database available to Web users, from the Unix server you add DynaText books to a book list, which adds them to the Web server's home page as hot links. If you have converted documents into SGML from a Windows-based PC, then in order to make them available to the DynaWeb server, you must either map the Unix server to a PC file server or copy files between the PC and the Unix server using an FTP or UUCP (Unix-to-Unix Copy Program).

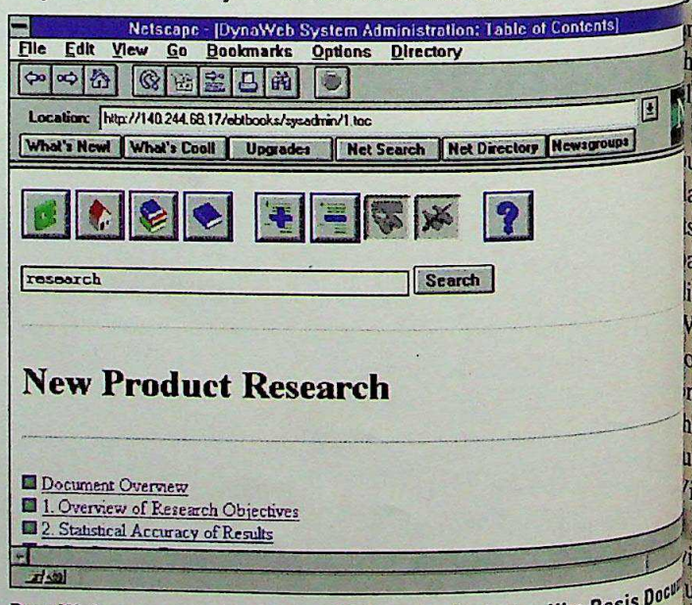
SUITABILITY TO TASK

DynaWeb

	Power	Ease
Installation and configuration	Good	Fair
Database accessibility	Good	Good
Customization	Good	Fair

The proprietary DynaText client has a split-screen interface with a table of contents on the left and the DynaText document pages on the right. While the company plans to incorporate Netscape frames HTML extension into DynaWeb, the current Web interface does not include the split screen. So at least for now, it is more difficult to use than its Windows counterpart. DynaWeb has added a toolbar at the top of each Web page, but navigation is much more intuitive with the proprietary Windows client. Similarly, while you can add documents to the database using the DynaText client, you can't add content directly from a Web browser.

Like the other products reviewed here, DynaWeb lets Web-browser users perform full-text searches. By default, the search option appears on the first page of the book along with the Web version of the table of contents.



DynaWeb converts content into HTML on the fly, but unlike Basis Document Manager and InterNotes, it doesn't let Web clients add content.

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Creating on-the-fly Web conversion is a natural extension for the DynaText architecture. DynaText uses a format-conversion tool called InStEd, similar to the Basis Document Manager's Style Guides, which converts a document's text and graphics into formats for different viewers. To enable HTML translation, however, you have to create a style sheet for that specific purpose first, a time-consuming task that is unnecessary with Lotus InterNotes Web Publisher or Folio Infobase Web Server.

DynaWeb and DynaText are designed for the serious electronic publisher. But because DynaText and DynaWeb run on Unix, PC-centric shops might feel less comfortable with the system's architecture.

DynaWeb 1.0. List price: $22,500 (includes DynaText 2.3c). Electronic Book Technologies, Providence, RI.

(No Indian partner.)

Folio Corp.

Folio Infobase Web Server

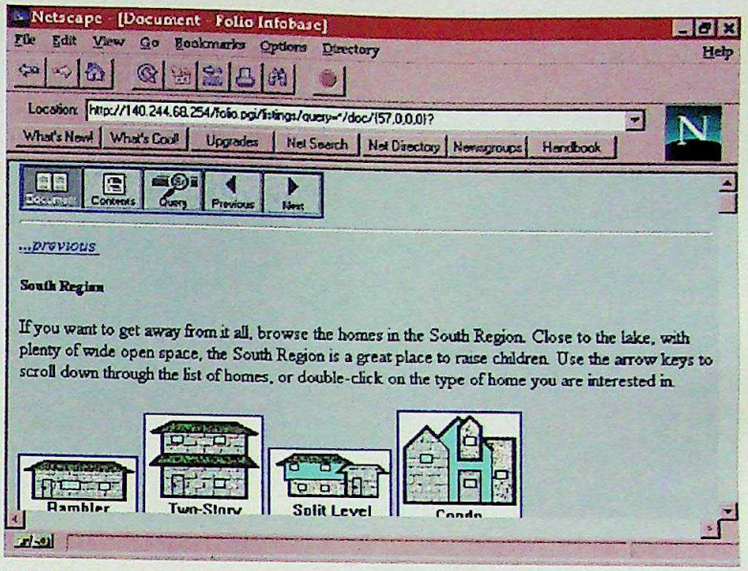
Folio Corp. has paired its database publishing system with the Folio Infobase Web Server 1.0 ($6,995) to let Web-browser users view Folio's hypertext, flat-file databases. The easiest product to set up, Infobase Web Server automatically and reliably converts documents into HTML without any manual style-sheet coding. But like DynaWeb, Web clients can't enter data into Folio databases, making the Infobase Web Server suitable only for electronic publishing.

PC MAGAZINE EDITORS' CHOICE

Folio Views ($895) is best known for publishing third-party documentation and databases on CDs. Folio typically licenses its search and retrieval technology to companies that use Folio Views to create and distribute documentation. The Infobase Web Server expands Folio Views' scope by converting selected databases to HTML on the fly, giving Web browsers much of the same rich-text and graphical-content functionality as proprietary Folio Views–client users.

We tested the Infobase Web Server with Folio Views 3.1a IPK (Infobase Production Kit), which provides proprietary DOS, Windows, and Macintosh clients for viewing and developing Folio Views databases. In addition to tools for infobase creation, development, and maintenance, the IPK clients include filters for importing databases, such as Lotus Notes databases, into a Folio Views infobase.

The Infobase Web Server, which runs under Windows NT Server 3.51, is a single-purpose server used solely for HTML conversion; you cannot use it as a generic Web server. Infobase Web Server works with any database in Views Infobase 3.1 format or above.



Folio's Infobase Web Server automatically includes basic navigation buttons on database documents.

Folio Views infobases are designed to be as free-form as possible: They don't have fields like a Notes database; instead they have a variety of distinct hyperlinks for navigating through the database. In testing, we found that many of the links converted perfectly into HTML page links.

READ ONLY

Setting up the Infobase Web Server and databases couldn't be much easier. The Web Publisher Data Source Manager lets you select databases you want to make available through the Web Publisher, and it lets you assign attributes (such as database title and location). Once the Web Server is activated, users accessing the Web site will see the list of available databases on the opening home page. While the administrator can make some basic modifications to the default home-page format, Infobase Web Server does not provide HTML editing tools. When a Web-browser user requests information from the document database, the Web Publisher converts the query result to HTML automatically.

SUITABILITY TO TASK

Folio Infobase Web Server

	Power	Ease
Installation and configuration	Excellent	Excellent
Database accessibility	Good	Excellent
Customization	Fair	Good

Infobase pages that get converted by the Web Server look reasonably close to the original text and graphics. Hot links, converted from Folio's hyperlinks, allow you to move among HTML pages as you would in Folio Views. But unlike the Folio Views clients, the Web-browser client cannot enter data into a Folio database (as can those of Basis Document Manager or InterNotes Web Publisher).

The pages look good, but, as with most products here, a great deal of the navigational aids of the proprietary client software don't translate well into the browser. The proprietary Folio Views client has a myriad of navigation aids for moving within an infobase and for jumping between search results, whereas the Web client only has the links between documents.

The all-important search capabilities of a database are all available to the Web client. With a Web browser you can use Boolean operators and even nest searches to refine results. But here again the Web client has limitations. Folio's proprietary Views client gives you a sharp, hierarchical map that immediately tells you how many hits will result from a given search. The search map under the browser provides less information.

The Folio Infobase Web Server can't be beat for its quick installation, especially for sites just starting electronic publishing. It comes with its own built-in Web server

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designed to work with Views Infobases. And reliable conversion offsets the product's lack of HTML-specific formatting tools. Of course, for sites already using a variety of Folio formatted databases, this is a natural and logical extension tool as you move your Folio Views infobases into your intranet or onto the Internet.

Folio Infobase Web Server 1.0. List price: $6,995; Folio Views, $895. Folio Corp., Provo, UT.
(No Indian partner.)

Lotus Development Corp.

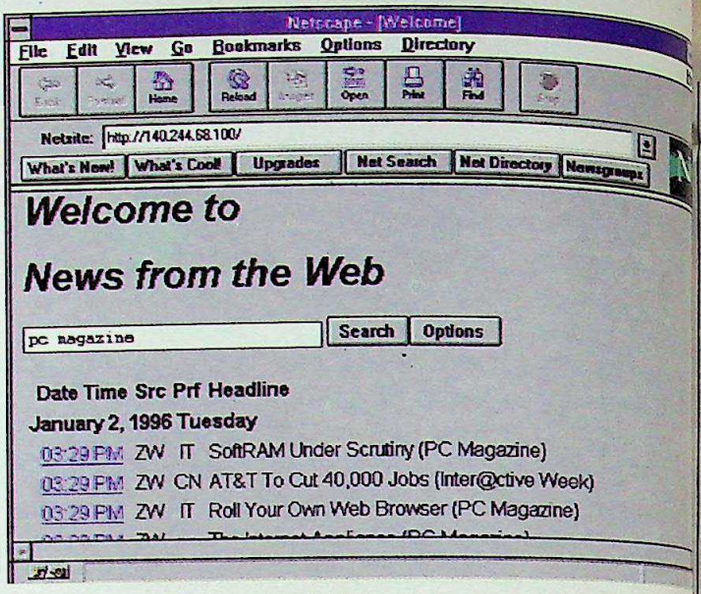
InterNotes Web Publisher

InterNotes Web Publisher, from Lotus Development Corp., gives Notes sites a quick way to convert existing Notes databases and applications into Web pages. The Web Publisher lets companies distribute Notes database text, graphics, and even embedded objects to Web-browser users and collect simple feedback from them. But unlike the other products we reviewed, the product currently requires a separate third-party Web server. Furthermore, because Web Publisher doesn't translate documents on the fly, you must maintain a separate document store for the translated HTML documents.

Web Publisher is an add-in server process that runs on Notes servers running Windows NT Server 3.51 or OS/2 Warp. We looked at InterNotes Web Publisher Release 2, which is sold for $3,647 for Lotus Notes 3.3 or higher. By mid-year, Lotus expects to offer a newer version of the Web Publisher free in versions of Notes Release 4 ($495 per server for the single-processor version). And current users of Release 4 will be able to download the new version of Web Publisher—in beta at press time—free from Lotus's Web site.

The basic function of Web Publisher is to convert Notes databases and documents into HTML 2.0 pages. It also allows Web-browser clients to perform full-text searches of Notes databases and enter data directly into a Notes database using HTML forms. Unique among the products here, the Web Publisher doesn't give Web users real-time access but rather converts documents at configurable intervals in batch mode. For example, you can set Web Publisher to translate a database into HTML anywhere from every second to every day.

Web Publisher requires a third-party Web server; a future release of Notes is expected to have a built-in HTTP server. Setting up the product is pretty intuitive, especially if you're already a Notes administrator. Web Publisher adds a configuration database to your Notes server that lets you specify which databases to publish to your Web server and how often.



InterNotes Web Publisher lets Web-browser users add data directly to N databases.

FORMAL AFFAIR

New to Web Publisher Version 2.0 is support for HTML forms, which lets Web users add documents directly to Notes databases. The administrator creates the forms in Notes and they are translated into HTML. Web Publisher implements forms using a common gateway interface (CGI) application. The Notes server and Web server must reside on the same physical machine for forms support to work.

But HTML forms are still limited compared with Notes Release 4 forms. For example, while you can create several buttons for standard Notes applications, Web Publisher cannot translate any button functionality. You are limited to just one button, which must be used as the Submit button, per Web application. So while you can create simple applications for searching databases, entering data, or participating in discussions, you will have difficulty implementing more complicated applications such as Web-based workflow.

Other Notes features don't make it to the common ground of the Web: Notes security, such as access control (ACLs), do not translate through Publisher. You'll have to implement rity through your Web server.

Web Publisher fairly accurately tr lates standard Notes documents forms, but without support for lin graphics the resulting HTML pages little crude. For greater flexibility in appearance of your Web pages and default home page, Notes and the Publisher permit you to enhance page adding HTML manually.

Web Publisher converts Notes V too. The default Notes view, a sum listing of database documents, gets verted into a list of hot links to the full uments. The Web Publisher also con Notes' proprietary DocLinks into HT links.

We liked the ease of use and flex features offered by Web Publisher. spite its occasional limitations in tran ing Notes documents and forms HTML. While you wouldn't want to InterNotes Web Publisher as your publishing platform, it's a basic exten for converting existing Notes data forms into HTML.

InterNotes Web Publisher 2.0. List P $3,647; included in Lotus Notes Relea $495 per server (single-processor sion). Lotus Development Corp., C bridge, MA.
(Indian subsidiary Lotus, New D Indian partner ITC, Calcutta.)

SUITABILITY TO TASK

Lotus InterNotes Web Publisher

	Power	Ease
Installation and configuration	Good	Excellent
Database accessibility	Good	Good
Customization	Good	Good

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INTRANET HOW-TO

Setting Up Shop

Intranets are working today. Not only are they a great way to provide access to corporate information and collaboration, but organizations are finding them easy to install. Add the fact that they are cost-effective and scale well and you have to ask yourself, why wait?

The Internet has grown strong on the basis of a couple of principles. One is that it enables the building of software from off-the-shelf components. Another is adherence to open standards. Both of these principles owe much to the fact that the Internet is based in Unix.

If you already have a corporate investment in Unix, your best bet is to build your intranet on a Unix platform. If not, don't worry; you don't have to learn Unix to set up and run an intranet. As the Internet has become enormously fashionable in recent years, software developers have focused on rapidly moving most of the Internet tools from Unix platforms to the PC and the Macintosh. As a result, today almost anything you can do on the Internet, you can do from a PC, and virtually any application you can set up on the Internet, you can set up on a PC.

THE WEB IS THE CENTER

Early intranet growth has been fueled not by the applications that originally grew the Internet, such as e-mail and FTP, but by the one technology that is grabbing all the headlines today: the World Wide Web.

The Web is a great way to share information. It is fun and easy to use, and a local Web costs very little to create. For example, if you are running Windows NT 3.51, all you have to do to set up an HTTP server that will dish out Web pages is download the Microsoft Internet Information Server from Microsoft's Web site and follow the instructions in the installation wizard.

Would Internet e-mail and newsgroups also be useful to a corporate intranet? Not really, at least for now. While there are some good POP3/SMTP e-mail servers for Windows NT, most don't offer any advantage over your current e-mail system, assuming you have one. And while NNTP (network news transfer protocol)—the technology that drives newsgroups—is also available with enough power for intranet collaboration, it is difficult to set up and use. It also offers no significant advantage over commercial group discussion products. But don't dismiss NNTP and POP3 yet; we may well turn a corner and see them staring back at us.

It doesn't take a major investment of time or money to get an internal Web site up and running.

By Rick Ayre

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STEP 1: GET TCP/IP

The TCP/IP protocol is the absolute center of the Internet, and it must be at the center of your intranet. It doesn't need to be the only protocol, and in many cases companies run TCP/IP on top of NetWare's IPX (Internet Packet Exchange), but most intranet applications need TCP/IP.

You have two choices. If your clients are running OS/2, Windows for Workgroups, Windows 95, or Windows NT Workstation, you can run the TCP/IP stack software available with those operating systems. If you're running NetWare for file and print services and many of your clients are still running Windows 3.1 or DOS on low-powered systems, you may want to consider an IPX-to-IP gateway between your Web server and the rest of your network.

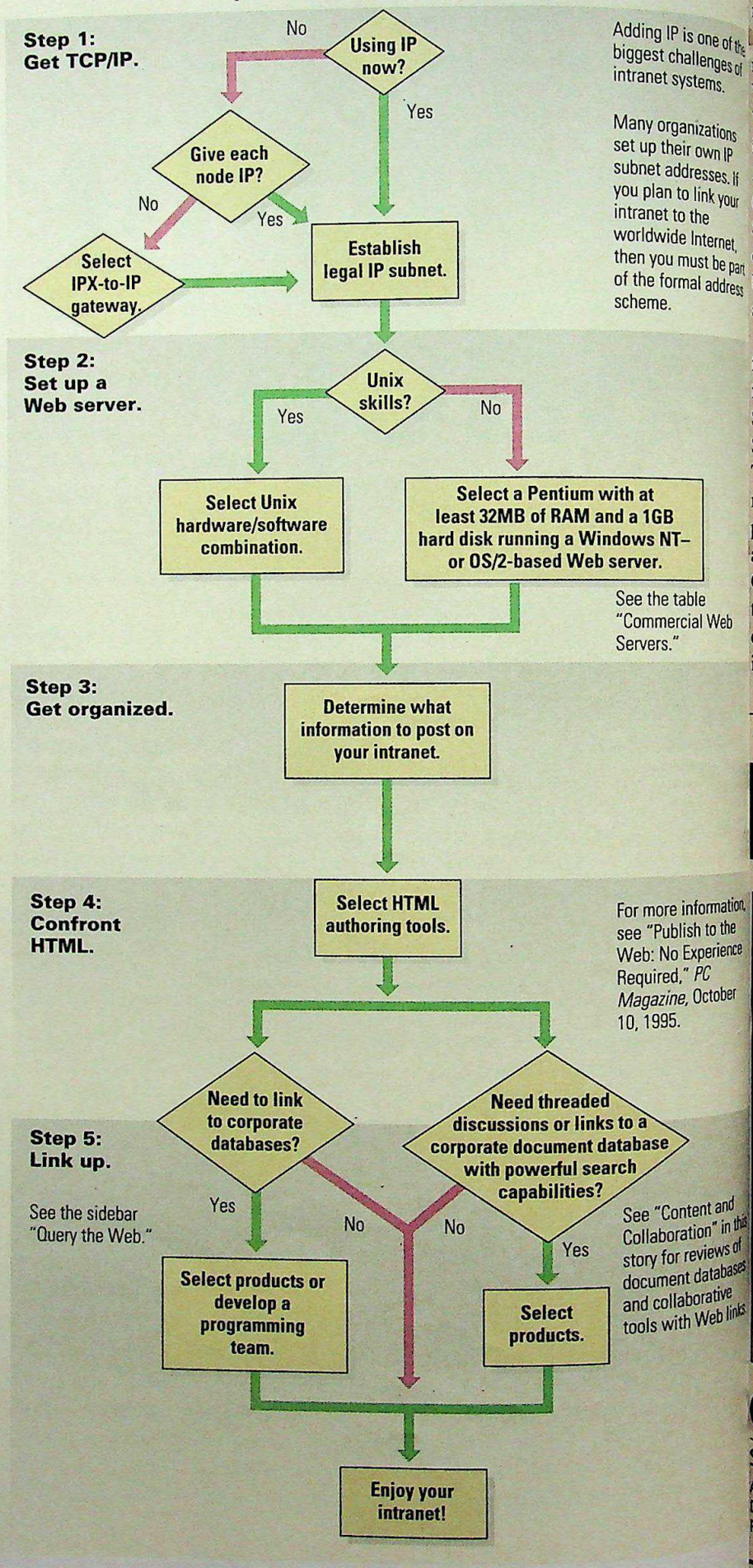
STEP 2: SET UP A WEB SERVER

Next you need to acquire a Web server, the one essential piece of intranet software. Free and shareware HTTP servers typically offer all you need to get an intranet up and running. Midrange commercial servers add tools for monitoring and maintaining your Web site. And to that, the best Web servers add security, encryption, and even links to corporate databases.

Of course, the size of your intranet is important. By size, though, we mean how many simultaneous connections you expect to your Web server, and how graphical the content you'll store on it. In truth though, since Web technology is so new, little definitive information on scaling is available. Most of the servers we mention below are capable of handling moderate traffic. In most cases where the traffic increases enough to slow server performance, adding hardware such as server system memory or a faster network connection, rather than upgrading your Web-server software, is the solution. Keep in mind that you'll probably want to start with at least a Pentium PC with 32MB of RAM and a 1GB hard disk.

The first popular Web servers were written at CERN and at the National Center for Supercomputing Applications (NCSA), the same group that developed the Mosaic browser. Both Web servers are generally distributed as source code for Unix platforms, but there is documentation for compiling the CERN server to run

Five Steps to Building an Intranet



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under Windows NT. Both are well documented on the Web (see "Useful URLs").

Microsoft makes its new Internet Information Server available free to owners of Windows NT 3.51 and includes it as part of Windows NT 4.0. Midrange Web servers include WebSite ($499) from O'Reilly & Associates and the new Spry Web Server ($495) for Windows NT. Spry also sells the Spry SafetyWEB server, which adds Architext's search engine, built-in SQL database connectivity, complete access control, and multiple virtual-server support.

Netscape servers come in a variety of flavors. For Windows NT, prices range from $495 for Netscape Communications Server to $1,295 for Netscape Commerce Server. Prices for Unix systems are higher. The Communications Server is the company's entry-level software, but it comes with powerful graphical administrative tools and proved an excellent performer. The Commerce Server adds support for secure transactions, which is a must for those doing business on the Internet and may be important to those starting an intranet.

Secure transactions allow encrypted communications between clients and servers. In most intranet applications such security is not necessary, but some in-house applications (Human Resources, for example) may call for it.

Web server–access control comes in a couple of flavors. Typically only some people will have the ability to create pages for your Web server. That kind of control is usually handled the way you already handle assigning reading/writing rights to network users. Then there are two ways to control user access, or their ability to read Web pages. There is what is called IP or host-name filtering, through which certain IP addresses are allowed access to certain pages on your Web server. There is also user verification, or password-controlled access to Web pages. All of the commercial servers we discuss support both IP filtering and user verification.

STEP 3: GET ORGANIZED

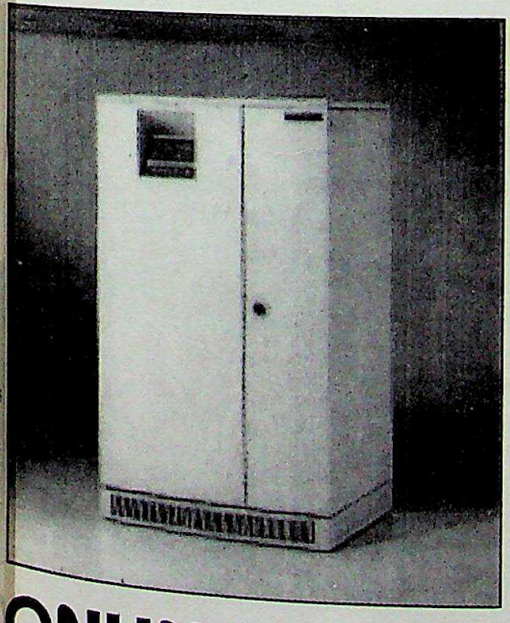
If you haven't already done so, now is the time for your organization to determine what kind of information it wants to share on its intranet. This will no doubt involve a process of meeting with departments, drawing up proposals, and getting approvals. One of the most important and most difficult things to determine up front is the content layout and navigational aspects of the intranet.

For design purposes, determine the structure of the information you're going to serve up: linear, hierarchical, or perhaps more gridlike or interrelated. If, for example, you want to create a simple step-by-step tutorial, then you would likely have a simple linear layout. Each page links to the one before it and the one after it. This is the simplest kind of Web design.

Hierarchical applications, such as a table of contents, are more difficult to create. You should diagram your links before you attempt to code them in HTML. A gridlike application—one in which a page links to many pages and each new page contains many links—is the most difficult to design well. It takes a lot of forethought—unless you plan to link Web users to a proprietary document database.

Sometimes when designing complicat-

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ed applications, it helps to have a print model in mind. For example, perhaps you want your application to be like a catalog, or maybe a magazine or reference book. Each application would have a different design, but the print equivalents can be used to guide you in your efforts.

STEP 4: CONFRONT HTML

Now you must prepare the actual content to be posted on the Web. That means coding in HTML or using some of the automated tools for preparing HTML documents. You have a few choices. You can create HTML documents from scratch; you can translate documents to HTML; you can use an integrated management system such as NaviPress or Microsoft FrontPage; or you can use an existing document database that provides automated on-the-fly HTML translation for Web users.

If you choose the first three options, you'll need to know some HTML syntax. Some of the best resources for a crash course in HTML are free on the Web (see "Useful URLs"). As you learn HTML, you can choose your own weapon .

Useful URLs

Site	Web address
Web server resources	
Yahoo!'s list of Web server information resources	*http://www.yahoo.com/Computers_and_Internet/Internet/World_Wide_Web/HTTP*
Yahoo!'s list of Web server software	*http://www.yahoo.com/Computers_and_Internet/Internet/World_Wide_Web/HTTP/Servers*
EMWAC's free Web server for Windows NT	*http://emwac.ed.ac.uk/html/internet_toolchest/https/contents.htm*
Microsoft's free Internet Information Server for Windows NT	*http://www.microsoft.com/infoserv*
NCSA HTTP server information	*http://hoohoo.ncsa.uiuc.edu/docs/Overview.html*
CERN HTTP server information	*http://www.w3.org/hypertext/WWW/Daemon/Status.ht*
Web developer's Virtual Library list of servers	*http://WWW.Stars.com/Vlib/Providers/Servers.html*
Feature comparison of Web servers	*http://www.proper.com/www/servers-chart.html*
HTML authoring resources	
Yahoo!'s list of HTML guides and tutorials	*http://www.yahoo.com/Computers_and_Internet/Software/Data_Formats/HTML/Guides_and_Tutorials*
InfoAccess's HTML Transit	*http://www.infoaccess.com/products/transit/httoc.htm*
Sausage Software's HotDog Web Editor	*http://www.sausage.com/dogindex.htm*
SoftQuad's HotMeTaL PRO 2.0	*http://www.sq.com/products/hotmetal/hmp-org.htm*
Intranet resources	
BES/Internet Services' Intranet Journal—information and discussion group on intranets	*http://www.brill.com/intranet*
Zona Research's intranet report highlights	*http://www.zonaresearch.com/Pubs/inet.html*
Netscape Communication Corp.'s intranet white paper and customer profiles	*http://home.netscape.com/comprod/at_work/index.htm*
Process Software Corp.'s intranet white paper	*http://www.process.com/news/intrawp.htp*
PC Magazine's InternetUser—news and reviews of Internet software	*http://www.zdnet.com/pcmag/IU/iuser.htm*

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Commercial Web Servers

The information in this chart is current at press time, but Internet software can change daily. Check the vendors' Web sites for the latest information.

Company	Product name	List price	Web address	Encryption	Database connectivity	Search engine included	HTML tools included
Windows NT Server 3.51							
CompuServe Internet Division	Spry SafetyWEB Server	$1,295	*http://server.spry.com*	SSL	ODBC	Architext's Excite	HoTMetaL Pro
CompuServe Internet Division	Spry Web Server	$495	*http://server.spry.com*	None	ODBC	None	None
Frontier Technologies Corp.	SuperWeb Server	$795	*http://www.frontiertech.com*	None	None	Verity's Topic	WebDesigner
The Internet Factory Inc.	Commerce Builder	$995	*http://www.aristosoft.com/ifact/inet.htm*	SSL	ODBC	None	None
The Internet Factory Inc.	Communications Builder	$495	*http://www.aristosoft.com/ifact/inet.htm*	None	ODBC	None	None
Microsoft Corp.	Microsoft Internet Information Server	Free	*http://www.microsoft.com/infoserv*	SSL	Internet Database Connector, ISAPI	None	None
Netscape Communications Corp.	Netscape Commerce Server	$1,295	*http://home.netscape.com*	SSL	Netscape Server API	None	None
Netscape Communications Corp.	Netscape Communications Server	$495	*http://home.netscape.com*	None	Netscape Server API	None	None
O'Reilly & Associates Inc.	WebSite	$499	*http://website.ora.com*	None	CGI for Visual Basic 4.0	WebSite search engine	HotDog Standard
Process Software Corp.	Purveyor WebServer for Windows NT	$495	*http://www.process.com*	SSL	ISAPI, ODBC	Verity's Topic	HoTMetaL (shareware)
Quarterdeck Corp.	WebStar 95/NT	$395	*http://www.quarterdeck.com*	None	None	None	None
Questar Microsystems Inc.	WebQuest	$495	*http://www.questar.com*	None	ODBC	None	WebEdit (shareware)
NetWare 3.*x* and 4.*x*							
American Internet Corp.	SiteBuilder[1, 2]	$1,495	*http://www.american.com*	None	None	None	None
GLACI Inc.	GLACI-HTTPD[1]	$475	*http://www.glaci.com*	None	None	None	None
GLACI Inc.	GLACI SecureServ[1]	$2,995	*http://www.glaci.com*	SSL	None	None	None
Novell Inc.	NetWare Web Server[1]	$995	*http://www.novell.com*	None	None	None	WordPerfect Internet Publisher
OS/2 Warp							
IBM Corp.	IBM Internet Connection Server for OS/2 Warp	$799	*http://www.ibm.com*	None	CICS, DB/2	None	None
IBM Corp.	IBM Internet Connection Secure Server for OS/2 Warp	$2,999	*http://www.ibm.com*	S-HTTP, SSL	CICS, DB/2	None	None

1 This product requires the NetWare/ IP NLM, which is included with NetWare 4.1.
2 This product includes IPAccess, an IPX-to-IP gateway.

If you are creating your HTML documents from scratch, an editor is the best choice. HoTMetaL Pro 2.0 ($195) was a *PC Magazine* Editors' Choice and is a good place to start. You can download a light version that is free (see "Useful URLs"). HotDog Professional ($99.95) is a new product, but an up-and-coming one. On HotDog's Web site, you'll find a demo free to try. These Windows editors are great aids in coding HTML documents and do a fair job of converting small documents from another source to HTML.

To convert a large volume of documents, though, you'll want an industrial-strength tool. Most of the conversion programs are new, so none have yet been involved in *PC Magazine* comparative reviews. A couple of products seem to have promise. One is HTMLTransit from InfoAccess; another is Cyberleaf from Interleaf. Both are fairly expensive, but they can make the process of translating large quantities of information much easier.

The complete Web systems, such as NaviPress and FrontPage, are perfect if you are planning a Web site that will change a lot. These products allow you to track links, edit pages in place on your Web server, and automate other mundane procedures that Web masters face.

STEP 5: LINK UP

Finally, if you will be providing access to hundreds or thousands of documents that change constantly, consider linking your Web server to one of the document databases reviewed in "Content and Collaboration." These packages provide users with robust search, viewing, and document management capabilities. They also come with tools for the on-the-fly translation of documents to HTML. You may also want to provide browser access to your corporate database systems. The tools for creating these links are discussed in "Query the Web." Finally, for group discussions on your Web pages, see our reviews of four Web collaboration products, also in "Content and Collaboration."

There are any number of good solid Web browsers, and many of them are free. The best browser is Netscape Navigator, which is not free but must be licensed. But many of the reasons Netscape is better may not matter to intranet publishers. For example, if you don't need Java application support or other cutting-edge plug-in application support built into your browser, then you probably don't need Netscape and can save a bundle by going with a free browser. Of those that are free, Microsoft's Internet Explorer and NCSA Mosaic 2.0 (*http://www.ncsa.uiuc.edu*) are among the best. WebSurfer from Netmanage (*http://www.netmanage.com*) is also a good free browser, and it runs on all Windows platforms. □

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BILL MACHRONE

Stimulation via Simulation

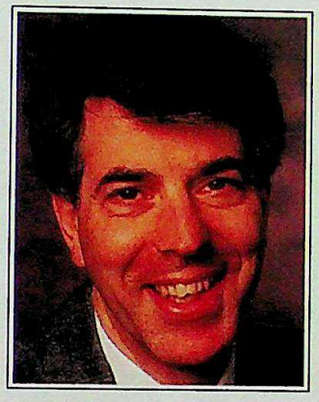
The electrical tower shook and vibrated as the wind increased. As it passed 120 mph, the deflection became visible. The power lines whipped with an unholy, subsonic resonance. As the wind increased to 150 mph, the tower began a weird, corkscrewing dance. Power lines snapped. A triangular brace failed, and the tower bent in the middle, as if bowing. The engineer turned from her computer screen and said, "That's why we don't use that design anymore."

I've also watched a surgeon reshape a child's face, damaged by a tragic accident, by cutting and fusing bones. He viewed the effects of the reshaping with some dissatisfaction and tried again, this time far more pleased with the result. When it came time to do the operation, he had a precise set of measurements and coordinates to ensure that the operation would be as quick as possible, with minimal likelihood of further surgery. Both were simulations, and dramatic ones at that.

We do simulations all the time, but they tend to be far more mundane—changing an assumption on a spreadsheet or projecting growth. One of the very first applications for computers—ballistics tables—were simulations, too, in the sense that they were predictions of an artillery shell's trajectory based on a number of variables. The big difference between then and now is visualization. Plugging variables into an equation is straightforward, and it's no problem to run the equation for each brace and spar on the electrical tower until you exceed the material's strength. The pages of numbers, however, are not nearly as convincing as seeing the tower self-destruct.

I've lately been fascinated by programs that simulate electronic circuits. Electronic components follow a number of well-defined rules (Ohm's Law, Kirchoff's Law, and so forth). It wasn't until the mid-1970s, however, that researchers at Berkeley created SPICE, a generalized way of describing components and modeling their behavior. It took a decade before SPICE became widely accepted, and nearly another decade before someone came up with a PC-based front end to SPICE that lets you build circuits by dragging and dropping components, wiring them, and simulating their behavior right there on your screen.

The two big competitors are CircuitMaker (MicroCode Engineering) and Electronics Workbench (Interactive Image Technologies, 416-977-5550), and they're truly amazing. They let you build analog or digital circuits, then watch them run. You might think that watching a circuit run is right up there with watching a refrigerator put the chill on a carton of milk, but this isn't the case at all. You can actually hook up "instruments" to your circuits, measure voltages and current flow, and even see waveforms on a variety of analog and digital oscilloscope-like displays. You control the settings of adjustable components from your keyboard, and things happen on the screen. Lights wink on and off, digital displays flash. Bulbs and fuses actually "burn out" if you exceed their ratings. Analog circuits show you their frequency response and attenuation. Digital circuits behave according to the principles of Boolean logic, with the additional real-world effects of propagation delays and device loading.



VISUALIZE THIS

Simulation software can save innocent semiconductors from senseless destruction.

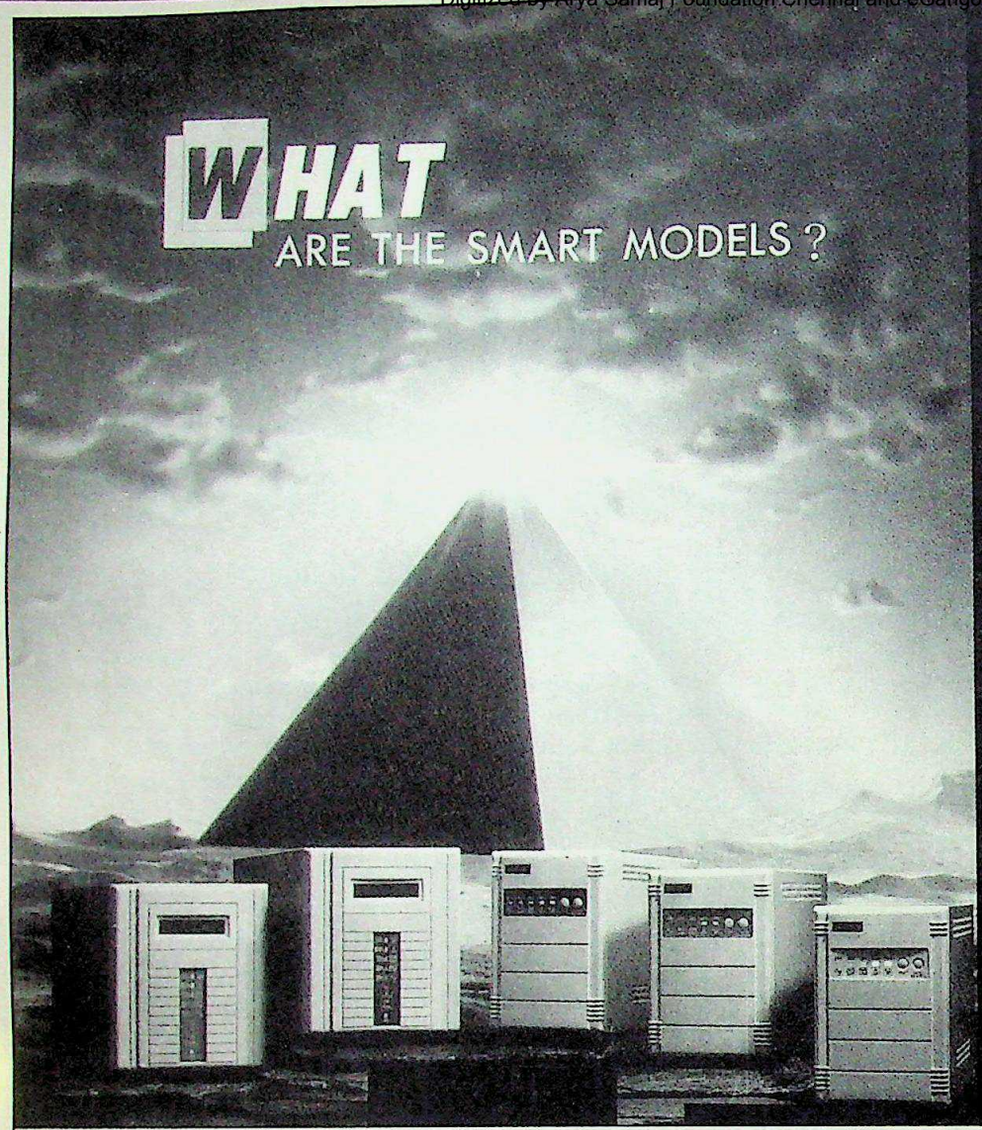
I tested both of these programs over the past couple of weeks, and I'd be hard-pressed to choose between them. I like the drag-and-drop circuit building in Electronics Workbench better than CircuitMaker's menu approach. But CircuitMaker allows you to mirror parts as well as rotate them. Both programs could benefit from tear-off menus, so that users could choose the tools that they need rather than repeatedly burrowing through menus. CircuitMaker's wiring tool is definitely superior to Electronics Workbench's in terms of routing and the wires behaving the way you'd expect them to, but both get the job done.

No computer is fast enough to model anything but the very simplest circuits in real time. Watching your circuit operate is much like watching a debugger step through your code. It may be a hundred times slower, but it gives you the assurance that the circuit will actually work.

The educational potential of any simulation program is huge. Technical schools are embracing these products as alternatives to time-consuming wiring and senseless destruction of innocent semiconductors. The programs themselves make no claim to being educational, but there's a world of hands-on learning in store every time you fire one up.

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MICHAEL J. MILLER

Netscape/Microsoft: Separated at Birth?

Recently, I attended developer conferences for Netscape and Microsoft, both held at San Francisco's Moscone Center. Despite the keen competition, I came away thinking how much the two companies have in common. Both are focused on the next generation of Internet applications and sites, and both sound like they've been using the same playbook.

Consider their visions for the Internet. Netscape talks about "rich content" and how the Internet will become more dynamic, how each new release of Navigator will integrate emerging media formats. Its flagship product, Netscape Navigator, isn't a browser anymore because you want to do more than browse, you want to interact. Now it's a client, with growing mail, news, and collaboration features.

Microsoft isn't satisfied with static content either. It wants an "active Web" and, toward that end, the company has introduced ActiveX technologies, a platform for Internet objects, which will first appear in Explorer 3.0. Microsoft talks about new standards for getting material from databases and for hosting multimedia components. Like Netscape, Microsoft is a proponent of integrating mail and news into the client.

Microsoft's plan for the Internet is simple: integrate the browser with the Windows Explorer—a powerful idea and one that, if it succeeds, would make Windows even more pervasive. Netscape has the bigger share of the browser pie now, but remember what happened with word processors.



PHOTOGRAPH BY ANDY FREEBERG

BROWSER BATTLE

Netscape has the bigger share, but remember what happened with word processors.

Both companies want to be *the standard platform*. Netscape talks about open strategies on open systems: Windows is big, bad, and closed. But then Netscape turns around and talks about Navigator being the "universal platform." Hmm. . .it sounds like Netscape's concept is that you can choose any OS, as long as you're running Netscape's software.

Strangely, Microsoft is talking about how open it is, how it is working through the standards committees while Netscape is busy creating its own standards. There's some truth to this, but I'm sure we can all think of instances in which Microsoft enacted its own standards despite other industry groups.

If the messages are similar, the implementations are very different. Netscape stresses plug-ins, Java applets, and JavaScript; and the company says it will develop something called JavaScript Wiring to tie everything together. It wants people to license its clients—a reasonable strategy, particularly for a company with 50 to 90 percent of the browser market. Netscape has introduced a two-tier server strategy comprising an "industrial-strength" server suite called SuiteSpot and FastTrack, a low-end solution spurred by Microsoft's free Internet Information Server (IIS) for Windows NT.

Microsoft has been forced to play catch-up. It licensed Java, adopted the standard used for Netscape plug-ins, and implemented HTML extensions for its own browser such as frames. Now Microsoft is emphasizing its own ActiveX format—a new, sexier name for what used to be called OLE Custom Controls (OCXs) and before that Visual Basic Extensions (VBXs), but now moved to the Internet. The key is that it will run Java applets as ActiveX objects, and the software runs VBscript as well as JavaScript.

Still, if you're creating a Web site today, it's easy to see why you would support Netscape's approach: There are more Netscape browsers, and even Microsoft supports Netscape's standards. While there are a lot of OCXs, many are too big and need to be retooled for the Web. Besides, many browsers don't support them.

That's why Microsoft needs to get more people using its browsers. It is apparently so afraid of Netscape that it is placing America Online on the Windows 95 desktop in exchange for AOL agreeing to use Explorer and ActiveX. On the server side, Microsoft sees Windows NT (with IIS and Back Office) as the platform. Obviously, Microsoft views Netscape's servers as a real threat or it would be charging for IIS. Same for the AOL deal. After all, you don't see Microsoft giving away Word, do you?

Like late-night hosts David Letterman and Jay Leno, publicly both companies talk about how there is room for both of them in a growing market. But in less guarded moments, both sound like they can't wait to kill off the other. The two companies may not like each other, but they are looking more and more alike every day. □

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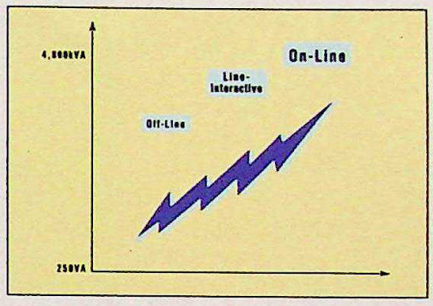
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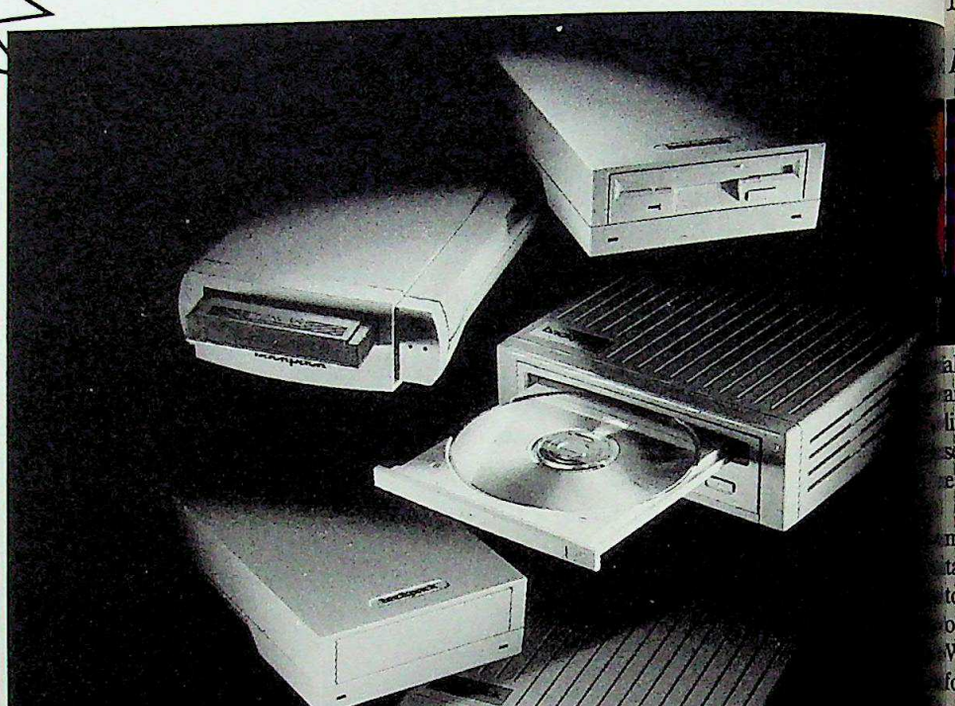
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The Netscape Security Breach

Navigator's encryption scheme gets broken: What do we learn?

By Jeff Prosise



One of the hottest stories in the computer industry in 1995 was the announcement that the security of Netscape Navigator, the world's most widely used Web browser, had been broken. This was August, and it turned out the break was more sensationalism—or perhaps misunderstanding—than anything else. But the next month delivered news of a genuine Netscape security breach, and this time I was all ears.

Unfortunately, the mainstream media didn't relate many of the details, so I was forced to look elsewhere to learn what really happened. Much of what I found came from the World Wide Web itself. The story that unfolded was far more interesting than anything I had read in either the general news media or the computer press. It also offered some valuable lessons in data security that anyone interested in doing business on the Internet would do well to heed.

In this column, I'd like to share those lessons with you. Should you trust the Internet and your browser software to handle credit card numbers and other sensitive data safely? Read on.

SECURE SOCKETS LAYER

The basis for secure transactions in Netscape Navigator is a protocol called the *Secure Sockets Layer*, or SSL. When you surf the Web with a browser such as Netscape Navigator, the browser communicates with the Web servers you connect to using a language called hypertext transport protocol (HTTP). To download an HTML (hypertext markup language) file representing a Web page, for example, the browser sends an HTTP GET command to the server and the server responds by transmitting the file's contents to the browser. The text of the GET command and the text of the HTML file are sent and received through connections called *sockets*, which enable two remote computers to talk to each other via the Internet.

Netscape invented SSL to address a fundamental security concern involving information transferred over the Web. Because the Web itself does not encrypt or disguise the data sent across it, someone who intercepts a Web transmission has complete access to the information contained therein. Information can be valuable, especially if it contains credit card numbers, PIN numbers for teller machines, or other sensitive data. The Internet can become a platform for large-scale commerce only if it's possible to conduct business transactions with complete privacy. If a transmission falls into the wrong hands, the information it contains—a credit card number, for example—should be unreadable to anyone other than the sender and receiver.

> Data is automatically encrypted before it is transmitted and then unencrypted on the receiving end. In between, it is a meaningless jumble of 1s and 0s to anyone who lacks the special key required to decrypt it.

SSL solves this problem by encrypting HTTP transmissions. For those familiar with the seven-layer ISO/OSI networking model and its relationship to TCP/IP stacks: SSL fits in between HTTP in the application layer and the TCP/IP protocols in the network and transport layers. Data is automatically encrypted before it is transmitted and then unencrypted on the receiving end. In between, it is a meaningless jumble of 1s and 0s to anyone who lacks the special key required to decrypt it.

The security of SSL hinges on how difficult it is to unlock an encrypted message without the key. SSL relies on RC4, a well-known block-encryption algorithm invented by Ron Rivest, a legendary figure in the cryptography community and one of the developers of the widely used RSA public-key algorithm. RC4 is generally believed to be secure, although the exact details of the algorithm are guarded and have not been subjected to independent scrutiny.

Assuming the algorithm *is* secure, the difficulty of cracking an encrypted SSL message is a function of the key length. If the encryption key is only 8 bits long, for example, messages would be easily decipherable because 8 bits allows for only 28, or 256, possible keys. A computer could arrive at a solution very quickly simply by trying all 256 keys. A key containing 100 bits, however, would present a formidable obstacle. With 2^{100} different combinations of 1s and 0s to try against the encrypted message, a supercomputer capable of testing 1 million keys per second would require centuries—no, eons—to find the right one.

The encryption key that Netscape Navigator uses to encode SSL transmissions is generated automatically on a per-session basis from information gathered at runtime. Versions of Navigator sold in the United States use 128-bit keys that, at least in theory, are virtually impregnable. (For more on Internet security methods, see this issue's Internet Tools column.) Versions of Navigator sold outside the U.S. use 40-bit keys, however, because that's the maximum permitted by tough U.S. laws that equate the export of encryption software with the sale of munitions to foreign governments. The U.S. government can crack a code encrypted with a 40-bit key in a matter of days or even hours.

THE SSL CHALLENGE

On July 14, 1995, an American computer user named Hal Finney posted what came to be known as the "SSL Challenge" on the Internet. The post included the binary transcript of an SSL transaction encrypted by Netscape Navigator using a 40-bit key. Mr. Finney's challenge: Crack the code and report back to him the fic-

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titious name and address included in the encrypted binary message.

The challenge didn't go unanswered for long. On August 15, a French doctoral student named Damien Doligez posted the answer. He had used 120 workstations and two supercomputers to crack the code with a brute-force approach that basically involved guessing a key, trying it against the encrypted message, and guessing again if it didn't work. Eight days and more than 500 billion keys later, he happened across the correct key. Word of his solution spread rapidly across the Internet and soon to the major wire services. Later it was learned that a trio of American researchers had arrived at the solution about 2 hours before Doligez. But it was Doligez who made news, and the media uproar that ensued prompted Netscape to issue an official response on August 17.

In its response, Netscape acknowledged Doligez's achievement but refuted the importance of it. The company pointed out (quite correctly) that the 40-bit key length was the key to the success of the brute-force attack and that the 128-bit encryption keys used in U.S. versions of Navigator were "practically impossible" to decrypt with current or "foreseeable computer technology." Netscape also calculated the worth of the computer time required to break the code—by their estimates about $10,000—and went on to say this:

RC4 40-bit is strong enough to protect consumer-level credit-card transactions—since the cost of decrypting the message is sufficiently high to make it not worth the computer time required to do so—and that our customers should use higher levels of security, particularly RC4 128-bit, whene er possible.

This level of security has been available in the U.S. versions of our products since last April. Because of export controls it has not been available outside the U.S. We would appreciate your support in lobbying the U.S. government to lift the export controls on encryption. . . . Finally, we'd like to reiterate that all [Doligez] has done is decrypt one single RC4 40-bit message. RC4 the algorithm and products which use the algorithm remain secure as always.

The gist of what Netscape said was correct. Doligez's successful attack wasn't an indictment of the RC4 algorithm but an indication of the weakness of 40-bit keys. The key length is something Netscape had no control over, and U.S. users could feel secure because their software used 128-bit encryption keys. What Doligez had really done was to refute the U.S government's assertion that 40-bit keys are strong enough to allow U.S. companies that deal in encryption technology to be competitive overseas. Clearly they are not—not when a private citizen (albeit one with access to an unusual amount of computing resources) can break a 40-bit RC4-encrypted message in little more than a week.

THE BACK DOOR

There's an old saying that a chain is only as strong as its weakest link. Up to this point, all the attacks on Navigator's SSL code had relied on brute force. What Netscape hadn't counted on was SSL's susceptibility to attacks by methods other than brute force.

On September 17, Ian Goldberg and David Wagner, a pair of first-year graduate students at U.C. Berkeley, published a method for decrypting SSL data that requires at most a few hours on a single workstation. Astonishingly, their method works equally well with 40- and 128-bit keys. Whereas the brute-force attack on SSL that Doligez engineered was, more than anything else, a demonstration of the power of parallel processing, the Goldberg/Wagner attack documented a bona fide security breach—and an extremely serious one at that. Here's what Goldberg and Wagner found and how they turned a chink in Navigator's armor into a hole that, as one analyst put it, "you could drive a truck through."

> You never know with absolute certainty that an encryption algorithm is secure; you can only be sure it's not secure.

A message that is RC4-encrypted with a 128-bit key is considered to be unbreakable because of the sheer number of attempts needed to guess the key by trial and error. Although 128 bits may not sound all that big, 2 raised to the 128th power is a *big* number, even for a supercomputer. But the effectiveness of the key length is reduced if the key is not truly random. Think of it this way: Someone tells you that you can encrypt a message with a 128-bit key but then says, "Oh, by the way—there are only 256 key values that I'll allow you to use." The actual key length is now meaningless, because the *effective* key length has just been reduced to 8 bits.

It turns out that when Navigator generated the SSL encryption key, it severely limited the number of values the key could take on. The problem was one of randomness, which is always an elusive quality on a computer because computers are designed to be very unrandom. Computers are incapable of generating truly random numbers, but programmers have come up with all kinds of ways to simulate them. Of course, some methods are better than others.

Goldberg and Wagner reverse-engineered the key-generator code in Navigator—they found that the key was derived from a "random" number that was in fact derived from some fairly predictable quantities such as the program's process ID and the current time of day. With this knowledge and some clever detective work, they were able to narrow the range of keys they tested. They cracked some messages in seconds and calculated that, at best, Navigator's 128 keys offered only 47 bits of security. In an excellent article in *Dr. Dobb's Journal* ("Randomness and the Netscape Browser," January 1996), Goldberg and Wagner presented the details of their attack and concluded that "even a remote attacker [could] break Netscape's [128-bit] encryption in a matter of minutes." The news took the industry by storm. The implications were enormous; at a time when the online community was just beginning to come to grips with the myriad security issues surrounding digital transactions, the security mechanism used by the world's most popular Web browser had been blown away. Within days Netscape acknowledged the problem and scrambled to revise Navigator's key-generation code to make it more "random" and less susceptible to attacks that don't require brute force. The new key-generation code has been made public so experts around the world can scrutinize it.

LESSONS LEARNED?

At least two important lessons can be learned from the Netscape security breach. The first is that any encryption scheme is only as strong as its weakest link. In Navigator's case, the encryption algorithm was sound but the key-generation algorithm was not. The second is that obscurity does not equal security. You cannot rely on the secrecy of an algorithm to provide security, because someone can always disassemble your code.

What Goldberg and Wagner did was a important lesson for all of us. An algorithm is considered "secure" only when its details are published for all to see and it stands up to years of determined attacks by expert cryptographers.

Ironically, you never know with absolute certainty that an encryption algorithm is secure; you can only be sure it's *not* secure. And that happens when someone breaks it. It's a mistake to trust sensitive electronic data to software whose authors say it's secure but won't subject it to rigorous and public testing. Be skeptical and insist on full disclosure.

Jeff Prosise is a contributing editor of Magazine.

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By Tony Pompili

Evolving Internet Security Methods

SSL has flaws—is Fortezza the answer to the Internet privacy problem?

Security is the buzzword of the day on the Internet. The Internet continues to grow globally, and intranets have become increasingly popular as well. This tremendous new market has provoked both users and service providers to seek greater assurances that information being passed along the Internet is secure.

Two areas of security on the Internet are being addressed: general security and financial-transaction security. Solutions to financial security problems could open up the Internet to a vast array of money-making services. Credit card giants MasterCard and Visa as well as software mavens Microsoft and Netscape are getting into the act. These are financial security issues, while this column addresses general security.

General security attempts to tackle basic privacy. For example, e-mail as it now stands hops from SMTP server to server. Sometimes it's copied from one hard disk location to another as simple text file, which means that anyone can read it. The Internet's approach to e-mail delivery is analogous to hanging your laundry on an outdoor clothesline rather than throwing it in a home dryer. It doesn't matter whether the message contains financial information: any information you send across the Internet should be private.

Besides content privacy, users want to know to whom they are talking. They need to be sure that the Internet server on which they're opening a session is the real McCoy, whether it's a World Wide Web, FTP, IRC, or other server. It doesn't take much for someone to imitate, or spoof, an unsecure server and try to collect private information about you. Of course, the service providers also want to be sure that the folks accessing its Internet services, such as mail and IRC services, are who they claim to be.

FIREWALL PROTECTION

Firewalls are by far the most standard security implementations in use today. These fairly secure but rather inflexible systems depend on a variety of techniques, ranging from filtering based on IP address to blocking users from direct access to the Internet and intranets. The problem with firewalls is that their specific purpose is to keep users off private networks and LANs. Sometimes they are used to keep private-network Internet enthusiasts, such as users on a corporate LAN, from accessing Internet services other than basic Internet e-mail. A firewall's premise is to protect private information and reduce unwanted traffic.

But Internet users and service providers prefer to think about general security as keeping information private to the sender and receiver and ensuring that services and users know exactly who or what is at the end of the line.

INTERNET SECURITY METHODS

	Firewall	SSL	PCT	S-HTTP	Fortezza
Pros	Isolates private LANs/intranets.	Current de facto standard; data privacy.	Uses SSL as base;better authentication encryption claimed; backed by Microsoft.	Specific to HTTP servers.	Secure token-based/Smart-card authentication, adopted by federal government.
Cons	Not standardized; better for keeping people out than letting them in.	Encryption algorithm not highly robust.	No other major supporters.	Not supported on other Internet platforms.	Expensive to implement.
Availability	Numerous third parties.	Microsoft, Netscape, and other major browsers.	Not currently available.	Web server manufacturers.	Third-party add-in security that hooks to your browser.

INCREASING PRIVACY AND SECURITY

THE SSL ANSWER

To this end, major software vendors have developed various options for dealing with the range of general Internet security issues. The most prominent and heavily backed is Netscape's Secure Socket Layer (SSL). Besides Netscape's own significant influence, other major players in SSL implementation include IBM, Microsoft, and even Spyglass. They are incorporating SSL to be used in client and server applications.

SSL 2.0, the current version, tackles two of the hottest areas of network security: authentication and encryption. *Authentication* ensures that both the user and server are who they say they are. From a user's standpoint, this usually means little more than entering a user identification and password. But authentication is more than an old-fashioned terminal-emulation user log-on. A snooping hacker could listen on the wire to these simple terminal log-in processes to intercept password and user-name information. *Encryption* deters such mischief by scrambling the user ID and password information before sending it over the wire (for more information, see "How Secure Is Encrypted Data?", *PC Magazine*, October 25, 1994). SSL bears a substantial similarity to such authentication techniques as PAP or CHAP, which many remote access systems use.

But passwords and IDs aren't the only data that needs to be protected from unwanted viewing. How about electronic mail or even a file being downloaded from an FTP server? SSL uses encryption—specifically, bulk encryption—to secure nearly everything that's transmitted between an SSL browser and a server.

Acceptance of SSL as a standard, like most standards in the PC industry, is based more on market consensus than certification by a standards bureau. SSL's heavy industry backing and widespread endorsement will make it a major player. Netscape, however, has been hedging its bet by seeking approval from standards bureaus in addition to industry acceptance. It submitted SSL 3.0 in Internet Draft form to the Internet Engineering Task Force (IETF) in an effort to get it certified as an Internet standard. If IETF does endorse SSL 3.0, Netscape's competitors benefit because the specification would then be made available for free to developers. For now, companies that incorporate SSL 2.0 into products such as browsers must pay Netscape a licensing fee.

SSL is far from flawless. Opponents have expressed concern about the shallowness of the encryption. Netscape uses a 40-bit key in the international versions of its browser and servers, as required by the State Department. The RC4 regulations—named for the RC4 algorithm on which SSL is based—limit the export of products with encryption keys longer than 40 bits. These regulations make Netscape's 128-bit encryption key illegal outside the U.S. The now-famous cracking of an SSL 2.0 key by two Berkeley graduate stu-

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dents created some doubt about how secure SSL-based systems are (for details on the Navigator security breach, see this issue's Tutor column).

Microsoft is attempting to correct the perceived shortcomings of SSL with an SSL superset protocol called PCT (Private Communications Technology), which is expected to be included in Microsoft's forthcoming Internet everything-but-the-kitchen-sink Information Server. PCT will spawn a second key specifically for authentication. The authentication does not fall under the RC4 restrictions, because the regulations deal only with bulk encryption. Microsoft also intends to build a more robust random-number generator. The generator, considered another weak link in SSL's security chain, seeds the encryption key.

SSL and PCT are hardly competitors, however. PCT is actually more like a chip off the old SSL block, and if all goes well, SSL and PCT will actually work hand in hand. Microsoft says PCT is backward compatible with SSL 2.0. PCT dovetails so tightly with SSL that PCT developers will still have to license SSL to build PCT-based systems. Unlike what has happened with SSL, not everyone is jumping on the PCT bandwagon. At press time, the list of vendors supporting PCT was fairly short, with Spyglass the most notable inclusion. While PCT's specifications aren't available publicly, Spyglass says it has specifications and is working on a hook into its browser.

Even when beefed up with PCT, SSL is still considered inadequate as a pure security solution. General security schemes like SSL with PCT keep users from seeing the content of messages and data going over the wire but do little to address the issues of limiting or securing access to services.

For some Internet users, privacy is not enough. One large and influential user group is the U.S. government. For the Feds, near bullet-proof authentication is the key. Ensuring that users are who they say they are and services are what they claim to be is critical. The preferred and indeed mandated solution for federal government Internet users is Fortezza.

FORTEZZA—NOT AN ITALIAN DESSERT

Here's how Fortezza works. User names and passwords are not enough to ensure authentication because they are easy to learn or discover. Like SSL and PCT, Fortezza also does bulk encryption, but it uses a minimum 56-bit encryption key based on DES (Data Encryption Standard) rather than the shorter 40-bit SSL and PCT keys.

Fortezza adds a third element to the authentication process known as a *token*. Each federal government Internet user will be assigned a token, a unique identification string stored on a credit card–size microprocessor. You need a password, or PIN, to use the token. To ensure both user and service authentication, every Internet service and user will need one of these token cards. But a card alone is not enough: A Fortezza system participant will need a reader, sort of like a credit card reader, to read the token from the card. So whether you're a single user or an FTP server, to decode Fortezza you'll need more hardware.

One company producing commercial versions of the card, called the SmartCard, is V-One Corp. in Rockville, Maryland. The company is also involved with writing custom Fortezza hooks into browsers for federal government clients attempting to comply with the government standards for authentication. By the way, if you are a Lotus Notes administrator and the Fortezza scheme sounds awfully familiar, it should. Although Notes doesn't use a hardware-based token, the Notes ID file and authentication architecture resemble Fortezza's structure.

Fortezza may sound a little ambitious, but since it's part of GOSIP (Government Open Systems Interconnectivity Protocol), you can be sure that software and hardware vendors looking for megabuck deals with the government will incorporate Fortezza hooks into their servers and client software. Fortezza will not likely be part of any widespread general-purpose or consumer-level security, but its status as a mandated Internet security system for both federal agencies and contractors will guarantee it a significant presence in any organization wanting a piece of the federal government business over the Internet.

One last protocol worth mentioning, since it seems to have drawn a little support from a handful of Web server companies, is S-HTTP (secure hypertext transport protocol). Developed by a company called Terisa Systems, the protocol is limited to dealing specifically with HTTP (Web server) transactions. The other specifications discussed here are more broadly designed to work with a variety of Internet server types.

Internet security will probably end up as a combination of specifications mentioned here (and others that have not yet joined the foray), similar to the PCT and SSL marriage. For example, Netscape has announced that it will support Fortezza as part of SSL, using the federal government's more robust authentication. Netscape, IBM, and others also have invested in Terisa, expecting to produce transaction security solutions based on SSL and S-HTTP. And, of course, how general security will interact with transaction-based systems is yet another story. One that you can be sure we'll be talking about here soon.

Tony Pompili is a contributing editor of PC Magazine.

ATTENTIO
READERS

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35.1% of this target group read **PC Magazine.**

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Modify Serial Numbers With Batch Files

Since the advent of MS-DOS 4.0, serial numbers have been assigned to disks during format. You'd think there would be some benefit to this, but to date I haven't found these numbers to be useful for anything. And they tend to be a nuisance, as they clutter the screen and send extra lines to the printer.

To eliminate unwanted serial numbers, I've written NOSERIAL.BAT (Figure 1). NOSERIAL makes use of the fact that the value 29h at address 26 in the boot section of a disk marks the presence of an extended BIOS Parameter Block. The next four bytes hold the serial number. If this marker is changed to 00, the serial number is no longer recognized. The batch file does not overwrite the serial number itself.

The number DOS sets is nearly random. If you'd like to have well-ordered serial numbers, NUSERIAL.BAT (Figure 2) will set serial numbers as desired. You pass five parameters to the batch file. The first is the drive letter, and the next four contain the serial number with the hexadecimal digits in the desired order. For example, to assign the serial number 1234-ABCD to the disk in drive A:, use the command

```
NUSERIAL a:12 34 ab cd
```

To restore a serial number that has been eliminated by NOSERIAL.BAT, just run NUSERIAL.BAT with the drive parameter only.

BRUCE W. SHUMWAY,
Silver Spring, Maryland

```
@ECHO OFF
IF '%1'=='' GOTO Syn
SET Opt=
FOR %%v IN (a A a: A:) DO IF '%1'=='%%v' SET opt=0
FOR %%v IN (b B b: B:) DO IF '%1'=='%%v' SET opt=1
::Use on hard disks disabled by default.
::FOR %%v IN (c C c: C:) DO IF '%1'=='%%v' SET opt=2
::FOR %%v IN (d D d: D:) DO IF '%1'=='%%v' SET opt=3
IF '%opt%'=='' GOTO Syn

ECHO L 0 %opt% 0 1 > t$e$m$p$
ECHO e 26 00 >> t$e$m$p$
ECHO w 0 %opt% 0 1 >> t$e$m$p$
ECHO q >> t$e$m$p$
DEBUG < t$e$m$p$ > NUL
DEL t$e$m$p$
SET opt=
FOR %%v IN (a b c d A B C D) DO IF '%1'=='%%v' SET opt=:
ECHO Serial number cleared from drive %1%opt%
SET opt=
GOTO End

:Syn
ECHO Syntax: NOSERIAL d:
ECHO         where d: is the drive to be cleared
:End
```

FIGURE 1: *This batch file effectively removes a floppy disk's serial number by making it appear to have been formatted with a DOS version before 4.0*

PC MAGAZINE: Every disk has a BIOS Parameter Block (BPB) at the start of its boot sector that contains essential disk specifications. DOS 4 defined an extended BPB, appending the 4-byte serial number and a copy of the Volume Label. Floppy disks formatted by DOS versions before 4.0 don't have serial numbers. The NOSERIAL batch file changes a single byte to make a floppy disk look like it was formatted using an earlier DOS version, thus preventing display of the serial number. I commented out two lines in each batch file to restrict them to drives A: and B:. There's always a possible danger when you meddle with a disk's boot sector, and that faint possibility of trouble outweighs the benefits of changing a hard disk's serial number. Be prepared for the possibility that these batch files will set off your antivirus monitor as well. They are totally virus-free, but antivirus monitors generally flag any program that modifies a disk's boot sec-

HIGHLIGHTS

HARDWARE Find out why a little cold treatment may be exactly what your unresponsive hard disk needs. *Page 109*

OPERATING ENVIRONMENTS We explain what the "Out of environment space" message means and how you can avoid it when you're trying to run a batch file. *Page 110*

WORD PROCESSING Microsoft Word's Ref field makes it possible to combine repeating text and sequential numbers. *Page 111*

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```
@ECHO OFF
IF '%1'=='' GOTO Syn
SET Opt=
FOR %%v IN (a A a: A:) DO IF '%1'=='%%v' SET opt=0
FOR %%v IN (b B b: B:) DO IF '%1'=='%%v' SET opt=1
::Use on hard disks disabled by default.
::FOR %%v IN (c C c: C:) DO IF '%1'=='%%v' SET opt=2
::FOR %%v IN (d D d: D:) DO IF '%1'=='%%v' SET opt=3
IF '%opt%'=='' GOTO Syn

ECHO L 0 %opt% 0 1 > t$e$m$p$
ECHO E 26 29 %5 %4 %3 %2 >> t$e$m$p$
ECHO w 0 %opt% 0 1 >> t$e$m$p$
ECHO q >> t$e$m$p$
DEBUG < t$e$m$p$ > nul
DEL t$e$m$p$
SET opt=
FOR %%v IN (a b c d A B C D) DO IF '%1'=='%%v' SET opt=:
ECHO Serial number changed for drive %1%opt%
DIR %1%opt% | FIND "Serial Number is"
SET opt=
GOTO End
:Syn
ECHO  Syntax: NUSERIAL d: xx xx xx xx
ECHO  where d: is the drive to get a new serial number
ECHO  and xx xx xx xx are the eight hexadecimal digits
ECHO  ordered as desired i the serial number
ECHO  Example: NUSERIAL a: 12 34 AB CD yields serial
ECHO  number 1234-ABCD
:End
```

FIGURE 2: *Use this batch file to set a floppy disk's serial number to any value you wish.*

tor, since that's the way many viruses reproduce.

In case you were wondering, the FORMAT program's algorithm for calculating the serial number is not random. It's an arcane calculation based on the precise date and time the disk was formatted. The four bytes of the serial number are:

- Month plus seconds.
- Day plus hundredths of a second.
- High byte of the year plus hours.
- Low byte of the year plus minutes.

This bizarre calculation isn't reversible; given a serial number, you cannot determine the date and time the disk was formatted.

You can download both of these batch files from PC Magazine Online.

Managing the Windows 95 New Menu

Right-clicking on the Windows 95 desktop or in an Explorer window brings up the New submenu, giving you the option to create a new folder or a file of a selected type. But after you've installed a number of new applications, that submenu can become quite cluttered with file types you may not need. Microsoft's TweakUI Power Toy allows you to add file types to the New menu, but it doesn't give you the ability to remove the ones you don't need. There is an easy way to do this, though, by editing the Windows 95 Registry. Here's how.

Start the Registry Editor by choosing Start | Run | Regedit. Then find your way on the Explorer-like tree to MyComputer\HKEY_CLASSES_ROOT. If you expand this branch, you'll see others named for the default extensions of different file types. Expand the one showing the extension of the file type you want to remove from the New submenu. For example, to remove the option that creates a new Excel document (.xls), find the Registry entry called MyComputer\HKEY_CLASSES_ROOT\.xls. Expand it and highlight the ShellNew entry underneath, then press Del to remove it and close Regedit. You can also delete any corresponding template file in the \WINDOWS\ShellNew folder.

Now when you right-click to bring up a New menu, the file type you removed will no longer appear. Of course, you can still create a file of that type by launching its application and clicking on File | New. One warning: Don't remove the ShellNew entries for .bfc and .lnk; these are used for creating new Briefcases and new Shortcuts, respectively.

JON MORROW, *New York, New York*

PC MAGAZINE: Items you'd want to remove from the New menu are ones you almost never use—the catch is that if you never use them, you may not know the corresponding extension. Don't worry: Just use the New menu to create an item of the doomed file type. Right-click on the new item and look at its properties to see the extension, then delete the item.

Suppose, for example, you want to remove Microsoft Office Binder from the New menu. Right-click on the desktop, click New, and choose Microsoft Office Binder. The resul file is called, by default, New Microsoft Of Binder.obd—thus, .obd is the exten whose ShellNew entry you want to rem Hold the Shift key while pressing De delete this file without sending it to the Re cle Bin. Now follow the instructions abo locate and delete the ShellNew entry for files; Figure 3 shows this entry as displaye Regedit.

The template filename specified in ShellNew entry is Binder70.obd. To rem the template file using Explorer, open ShellNew folder found in the Windows folder, locate Binder70.obd, and delete it safer, though, to leave the template file al in case you ever want to restore the del item to the New menu.

Cautious users may prefer a less perma method for suppressing file types from New menu. Try this: Launch Regedit and n igate as described above. But instead of de ing the ShellNew key, rename it to someth like ShellNewX. The offending file type longer appears on the New menu, but you restore it to favor simply by renaming same key back to ShellNew.

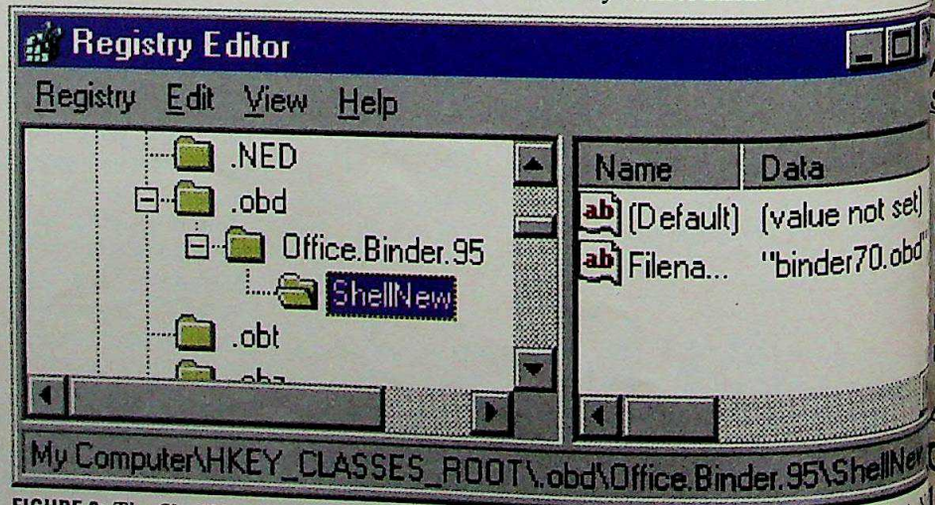


FIGURE 3: *The ShellNew key causes the corresponding file type to appear on the desktop's N menu; the string value called Filename names the template for that file type.*

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Ask Our Advisors

HARDWARE

Moving to the Fast Lane

I have an internal 14.4-Kbps fax modem. I'd like to upgrade to a 28.8-Kbps modem soon and possibly to ISDN in the near future, but my system has the "old" UART chip and I'm not sure whether I can upgrade it on the motherboard. I also don't know whether I should buy an internal or external modem (I'd prefer an internal).

If I were to upgrade by buying a new serial card adapter with a new UART, would an internal modem use the new one or the old? (I have the ability to disable the on-board COM ports through the BIOS.) I assume an external modem would use the new UART.

Also, is there any way (besides swapping cables) to use both a 28.8 analog modem and an ISDN modem? My mouse is already hooked to COM2. The modem is connected to COM1, and I'd rather avoid the problems of using COM3 or COM4—I've tried that before!

NEIL RUDISH, *Canton, Michigan*

PC MAGAZINE: First let's make sure we have the facts in order: An internal modem will have its own UART integrated into its circuitry, so you don't need to worry about upgrading the motherboard UART to use a new internal modem. An external modem, on the other hand, relies on the serial port in the computer (the UART is part of the serial port). And the UART that the external modem uses completely depends on the serial port it's connected to: If you plug a new external modem into your old serial port, the modem will use the old UART.

So, if you were going to use an external modem, you'd want to upgrade to a 16550 UART; an inexpensive serial card with this support will cost $20 or less. You'd then disable the COM1 port on your system's motherboard and simply replace your old internal modem with the new serial card.

When you add ISDN to the mix, there are two connections to consider: the serial connection and the phone line. For the phone line, you'll find that some modems—such as the Motorola BitStream—have an analog jack in the back that you can use to connect a modem or telephone to your ISDN line. This means that you may be able to plug your analog modem directly into the ISDN modem, without the need for an additional phone jack.

For the serial connection, you'll still need a serial port on your computer. If you don't want to hassle with more than two serial ports in your system, you have two options. One is to get a high-speed serial port and an external 28.8-Kbps modem now; when you add ISDN, get an external ISDN modem and a serial switch box. (It is unlikely that you'll be using both the ISDN and 28.8-Kbps modems at the same time.) The other route would be to get a bus mouse and card to free up your COM2—this could cost as little as $30. You'd then have the option of getting an internal ISDN modem or a high-speed serial port and an external ISDN modem. You would need an available IRQ for the bus mouse, but this may be easier than trying to solve the problems of configuring three serial ports in one system.

—Alfred Poor

Room Service

One of our employees travels a lot with a laptop computer, and he often needs to send data back to the office via modem. Over the last few months, he has destroyed four PC Card

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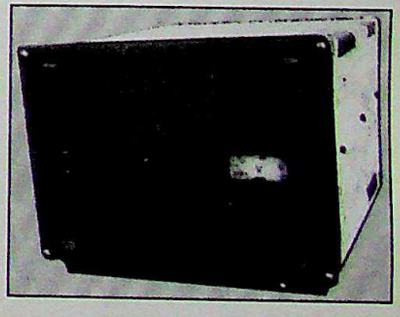
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modem cards. He plugs into a data port on a phone or wall jack and not only can he not get a dial tone, the modem is then ruined. At first I thought there might be something wrong with the slot, but then the same thing happened with a different machine. Do you have any idea what might be causing this and how to keep it from happening again?

ROB PERSCHAU, *Kansas City, Missouri*

PC MAGAZINE: Chances are good that your traveling colleague is plugging into hotel phone lines that are connected to digital phone systems. Just because your modem's telephone cord fits a jack in the wall doesn't mean you can plug it in safely.

Most telephones use analog signals, including the standard phone jacks we use at home. But some hotel, motel, and office telephone systems use digital signals that can instantly fry a standard modem. (ISDN is starting to change all this, but we're probably still a long way from seeing ISDN jacks in the average motel room.)

One solution is to avoid plugging a modem into a jack unless it is clearly labeled as a data port or intended for a modem. More and more hotels provide these as separate jacks on the wall or, even better, as special jacks on the side of the telephone. But they aren't available everywhere, unfortunately, and some hotels feature them only in certain rooms. So you should add this to your reservation check list along with your other preferences to make sure it's available when you need it.

You can also use an adapter that lets you plug analog modems into digital phone systems—for example, the $149 Linc Up II, from Black Box Corp., and the $159 Konexx Model 111, from Unlimited Systems. These devices let you safely plug your modem into a digital phone system.—*Alfred Poor*

Cold Treatment for Hard Disks

I normally leave my computer running at all times, with no problems. Whenever I lose power, though, the hard disk usually refuses to spin back up. I have to keep switching the power on and off until the disk finally starts up again.

The last time this happened, I was unable to get the drive to spin up no matter what I did. I had heard that putting an unresponsive hard disk in the freezer sometimes helps to restore it, so, in desperation, that's what I did. I put the disk in the freezer for about 2 hours, just long enough to get it ice cold but not long enough to actually freeze the components. I then plugged the drive back in and was surprised to find that it worked: The drive came right up to speed on the second attempt! Can you tell me why this would help?

GREG SADDLER, *Atlanta, Georgia*

PC MAGAZINE: When an old hard disk won't spin up, a deep-freeze treatment, oddly enough, can treat two of the possible causes: tired, old lubricants and *stiction*—where the read/write head actually gets stuck on the surface of the disk's platter. There is a more permanent fix for the first problem, but the second can be cause for concern.

The bearings in a disk drive are lubricated, and the oil grows stickier over time as it wears out. As long as the drive is warm and spinning, the bearings work fine, but when the oil cools, the motor shaft may get stuck. The deep-freeze technique can cause the mechanical parts to contract, breaking the bonds and allowing the motor to spin up to speed. As long as you can get the disk spinning, you don't really have anything to worry about, but you might want to give the motor spindle a drop or two of penetrating oil or light machine oil to help thin out the thickened old lubricants.

> When an old hard disk won't spin up, a deep-freeze treatment, oddly enough, can treat two of the possible causes.

The other problem is less benign. Older hard disks let the read/write heads come to rest in contact with the hard disk platter's surface when the power is turned off. That's why it was so important to "park" the heads of those older drives before turning the machines off, so that the heads would be moved to a safe portion of the disk where no data was stored. When the disk was started, the heads would drag around and around on this point until there was sufficient air pressure to fly the heads above the platter's surface.

This dragging of the heads along the platter inevitably damages both the disk and the heads themselves. Debris often builds up between the platter and head, causing the two to get stuck together. The freezer fix again uses contraction to break the bond; it is a better approach than the "whack it with a hammer" solution that is sometimes recommended. Unfortunately, there's no permanent solution to this problem; because it can be a sign of potentially fatal wear within the drive, take extra care to keep your backups current if you suspect that stiction is behind your disk's reluctance to spin.—*Alfred Poor*

OPERATING ENVIRONMENTS

Expanding Your Environment

I'm having a problem using NO.B (described in the User-to-User colu of April 25, 1995). I typed it in a rected, but I get an "Out of environment spa message every time I try to run it. What does message mean and why am I getting it?

J.R. WARRICK, *via Inter*

PC MAGAZINE: The environment is an area memory DOS reserves for environment v ables. These variables are used to define c tain aspects of operating system or other p gram behavior.

Some environment variables, such as PATH and PROMPT variables, belong to D itself. PATH tells DOS which directories search for executable program files, PROMPT controls the appearance of DOS prompt. Batch files can define envir ment variables of their own for use as te porary storage. You use the SET comm to create an environment variable (S name=value) or to clear one from mem (SET name=). To reference the value of environment variable, you enclose it i pair of percent signs:

```
ECHO Value of variable name is %name%
```

The environment is small by default, h ever. It's just a few hundred bytes—the cise value depends on your particular version. DOS can expand the environm only for the primary command process that is, the one started at boot-up, not a W dows DOS box or "shell-to-DOS" op from a program. And it can do so only RAM-resident programs have been loa In general, once the environment is fu variables, any attempt to create another fails and will trigger the "Out of environ space" error.

Like many batch files, NO.BAT keeps its vironment variables to itself. It uses ther ternally and, when finished, deletes th There's an easy way to get all the environ space you need for such a self-contained file. Simply run the batch file under a ondary command processor that has a b environment. For example, you might

```
COMMAND /E:1024 /C NO *.ZIP DEL *.*
```

The /E:1024 switch gives the secon command processor 1,024 bytes of env ment space, and the /C switch tells it to cute the command that follows and the minate. The only time you can't use

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technique is when the batch file must return a value in a particular environment variable, as all changes to the environment vanish when the secondary command processor terminates.—*Neil J. Rubenking*

Finding the Nearest Printer

In order to determine the location of a LAN workstation and attach the closest printer to it, I set the volume label on the boot drive to the room number containing the printer. Then I used a batch file to put the volume label into an environment variable. Every now and then, however, our college-student users change those volume labels (just accidentally, of course), so I'd like to set the variable from the contents of a read-only file. Can you help me do this?

HERBERT E. DONUS,
Tortola, British Virgin Islands

PC MAGAZINE: Rather than attempt to load a file into an environment variable, you can create a file that sets the variable itself. Here's what you do: Create a batch file called SETROOM.BAT in the root directory of each workstation. In this batch file, place a single line, such as "SET ROOM=1234," where "1234" is replaced by the room number containing the closest printer. Use the ATTRIB command to set the hidden and read-only attributes for that file.

DOS won't display hidden files in a normal DIR listing, but it has no problem executing them. Just CALL C:\SETROOM.BAT to get the ROOM environment variable set to the correct room number. Then use the variable just as you were using the room number extracted from the volume label.

Of course, your students could still locate and trash the SETROOM.BAT files, just as they've changed the volume label. But it would be harder to pass off this degree of mischief as an accident!—*Neil J. Rubenking*

File Manager's New Math

Here's a problem no one seems to be able to help me with. I use Windows 3.11, and the status bar at the bottom of File Manager always shows the incorrect size of the file that is highlighted. I noticed this first when the status bar indicated that a 1.44MB floppy disk had only 1.38MB of free space available. I can successfully copy 1.44MB to the floppy disk, but it's really aggravating to always have to add up the sizes of various files. Is there a way to correct this so that the status bar will show the correct size of the selected file(s)?

AARON WIECZOREK, *via ZD Net*

PC MAGAZINE: In the time-shrouded history of computer science, someone decided that when referring to computer memory or disk space, the meanings of the familiar prefixes *kilo* and *mega* would change. Thus one kilobyte came to mean 1,024 bytes (2 to the 10th power), not 1,000 bytes. And one megabyte is 1,048,576 bytes (2 to the 20th power), not 1,000,000. This decision has been a source of confusion ever since.

A so-called 1.44MB floppy disk actually holds 1,457,664 bytes. Divide that capacity by 1,048,576 (one megabyte) and you get 1.39. It's not clear why File Manager reports 1.38 instead, but the difference is certainly not as great as you expected. Similarly, a file that's 45,568 bytes in size will be reported as 44.5K. That's not an error or a slipped digit, it's the result of dividing the size by 1,024 rather than 1,000.

In short, there's nothing wrong with File Manager except perhaps a slight underestimation of the disk's total capacity. It's just a matter of remembering that you divide the total number of bytes by 1,024 (not 1,000) to get kilobytes and by 1,048,576 (not 1,000,000) to get megabytes.—*Neil J. Rubenking*

Breaking out of OS/2

Help! OS/2 is stuck in a loop, and I can't break in and get control of my system. I was running a program and OS/2 locked up. I was able to reboot and thought that would be the end of it. But OS/2 keeps trying to restart the program, which then locks it up again. How can I break the cycle and get control of my system again?

GEORGE AXLE,
Hoosic Falls, New York

PC MAGAZINE: One of OS/2's features is the ability to remember all programs that were running when you shut down and to start them up automatically during the next boot. Users often choose to leave programs running when they shut their systems down to take advantage of this feature. Unfortunately, when a situation like yours occurs, this feature ends up looking more like a bug.

To stop this automatic program start-up, you need to change a statement in your CONFIG.SYS file. The format for the statement is

```
SET RESTARTOBJECTS=
```

The possible parameters are YES, NO, STARTUPFOLDERSONLY, and REBOOTONLY. The default for this statement is YES, so if the statement doesn't appear in CONFIG.SYS, all running objects are restarted. If you set the statement to NO, nothing will be started after a boot, including programs you've put in your Startup folder. If you want to start only the items in your Startup folder but not any other programs that might have been running, use STARTUPFOLDERSONLY.

The last parameter refers to a situation described in the Solutions column of December 5, 1995. OS/2's Workplace Shell sometimes detects internal problems and resolves them automatically by "rebooting" itself without the user ever knowing about it. When this occurs, though, the Workplace Shell restarts things just as if a complete system boot had taken place. If you use the REBOOTONLY parameter, the Workplace Shell will not restart programs and folders automatically after this kind of reset. In most situations, the best idea is to add the following line to CONFIG.SYS:

```
SET
RESTARTOBJECTS=STARTUPFOLDERSONLY
```

Move anything you want to start automatically to the Startup folder (you'll find it in the OS/2 System folder).

How do you make this change if you can't get control of OS/2 in the first place? You have two choices. First, you could boot from the installation disks. After you've been prompted to insert disk 1, you'll see a welcome panel. Pressing Esc then takes you to an OS/2 command prompt where you can use the command line editor TEDIT located on that disk to change your CONFIG.SYS file.

An easier technique is to keep an eye on your system during its next boot cycle. As soon as the colored desktop background appears but before any icons are placed on the desktop, press the left-hand Ctrl and Shift keys and F1 at the same time. This tells the Workplace Shell not to restart any objects, thus breaking the cycle you're stuck in.
—*Brian Proffit*

WORD PROCESSING

Combining Repeating Text and Sequential Numbers in Word



I needed to create sequentially numbered tickets for a New Year's Eve party. Microsoft Word's AutoNum field worked well for generating the numbers, but I had to enter the text separately for each ticket. And when I needed to make changes, I had to make corrections on each ticket.

Making the corrections is only a minor chore, thanks to global search and replace, but I wonder if there's a way to use a field to insert the repeating text. That would let me enter any changes once, then update the field throughout the file.

WILLIAM E. KING, *Phoenix, Arizona*

PC MAGAZINE: The field you're looking for is the Ref field, which inserts text you've defined

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as a bookmark. Start by entering the text you want repeated. Then select the text and choose Edit | Bookmark to open the Bookmark dialog box. Enter a name for the Bookmark in the Bookmark Name text box—Ticket, say—and choose the Add button to create the bookmark and close the dialog box.

Once you've created the bookmark, you can reproduce it with a Ref field as many times as you like. The most straightforward way to create the field is to type Ctrl-F9 to insert the field markers, which look like left and right curly braces. Then type Ref Ticket (assuming you named the bookmark Ticket) or simply Ticket between the braces so that the field reads {Ref Ticket} or {Ticket}. Finish up by hitting F9 to update the field. Assuming you have Word set to show field results rather than field codes, the field code should be replaced by a copy of the bookmarked text. If you still see the field codes, toggle Word to show field results instead by hitting Alt-F9 or by choosing Tools | Options, going to the View card, and making sure the Field Codes check box isn't checked.

After creating the Ref field, you can select it; choose Edit | Copy, then use Edit | Paste to paste as many copies as you need into the file. Then, if you need to make changes, you can make them to the original text at the beginning of the file, select the entire document with Ctrl-<NumPad 5> (the 5 on the numeric keypad), and hit F9 to update all the Ref fields in the file at once.

Not so incidentally, you're better off using Word's Format | Bullets and Numbering command instead of AutoNum for automatic numbering, though you will have to be careful about how you insert paragraphs. Since Word will number every paragraph you add, you'll want each ticket to consist of only one paragraph. And that means you'll need to force new lines within each ticket with the new-line command (Shift-Enter) instead of a carriage return.

Assume, for example, that the tickets are large enough to hold five lines of text, and you want the ticket to take the form:

1001
New Year's Eve Party
$10.00 per person
Dec. 31, 7 P.M.

The last line is left blank. For simplicity, I'll assume that the paper stock has room for one ticket across.

To create this ticket, start by entering the text, leaving a blank line for the number at the top and using the new-line command rather than the Enter key to create each new line. If you set Word to show paragraph returns (choose Tools | Options | View and make sure the Paragraph Marks check box is checked), you'll see the new-line code as a small, left-pointing arrow (←) and a true carriage return as a paragraph mark (↵). At this point the file should look like this:

New Year's Eve Party ↵
$10.00 per person ↵
Dec. 31, 7 P.M. ↵

Now select everything, including the carriage return at the end, and create a bookmark. Then choose Format | Bullets and Numbering, go to the Numbered card, select the first format on the first row, and choose modify to open the Modify Numbered List dialog box. Remove the period from the Text After box so the number won't be followed by a period. Set the starting number in the Start At box to an appropriate number such as 1001, and choose OK. Word will return you to the document, which should now include a ticket number on the first line.

If you move the cursor to the last line and hit Enter, Word will start a new paragraph and number it. Create the Ref field immediately after the number on the same line, hit F9 to see the field result, and you'll have a second ticket in the same format as the first. Next, select the field you just created, along with the paragraph return at the end of the ticket, and choose Edit | Copy. Then move the cursor to the blank line at the end of the ticket, hit return to start a new numbered paragraph, and use the Edit | Paste command to create as many tickets as you need.—*M. David Stone*

SPREADSHEETS

Filling in the Blanks in Excel



I recently imported a Lotus 1-2-3 spreadsheet containing several empty cells into Microsoft Excel. I would like to use Excel's Autosum feature to total up the values in each column, but Autosum doesn't seem to work correctly if there are blank cells in a column. Is there a way to fill all the empty cells with a value of $0.00 (just for summation purposes) without hunting through the entire spreadsheet?

OVERTON ISAACS, *via the Internet*

PC MAGAZINE: The following Visual Basic for Applications procedure should take care of your problem:

```
Sub FillBlanks()
 For Each Cell In Selection
  If Cell.Value = Empty Then
   Cell.Value = 0
   Cell.NumberFormat =
   ➥"$#,##0.00_);[Red]($#,##$0.00)"
  End If
 Next Cell
End Sub
```

Choose Excel's Insert Macro Module command, then type this code into the new macro sheet. Return to your worksheet and select the columns you imported from 1-2-3. Choose Macro from the Tools menu, select Fillblanks from the ensuing dialog box, and click Run. Your empty cells will fill with zeros formatted as you wanted using one of Excel's built-in currency formats.—*Craig Stinson*

DATABASES

Wrapping Text in FoxPro for MS-DOS



A problem occurs in FoxPro for MS-DOS 2.6 when you use streaming output with the ?or ?? commands and the STYLE clauses. When the output wraps, FoxPro switches the STYLE code back to normal, regardless of the style in use. This also happens when you print a Memo field if a Memo field wraps, and it happens even in the middle of an object that falls at the end of a wrapped line.

This causes a lot of difficulties, since I need to be able to produce camera-ready output. Can you help?

NIKOLAUS E. WOL
Hanover, New Hampsh

PC MAGAZINE: Microsoft suggested the workaround shown in Figure 1. You use the Xwrap function instead of the ? or ?? commands to output your strings to the current printer. The function uses the left and right margin settings (_LMARGIN and _RMARGIN) to anticipate where a wrap would occur and instead sends your string to the printer in pieces. That way the wrap doesn't happen and you don't lose the STYLE setting. You should be sure to use the SET PRINTER ON command before calling the function, as well as the SET PDSETUP TO command to assign the proper printer driver. Of course, you must use the SET PRINTER OFF command when you're done.

To use the function, send it three parameters: the string to print, a style clause, and whether you want the string to begin on a new line or not. For example, suppose you have a paragraph of text stored in the variable cString that you want to print in bold starting on a new line. To send it to the printer using the Xwrap function, you'd use the following:

```
=Xwrap( cString, "B", .T. )
```

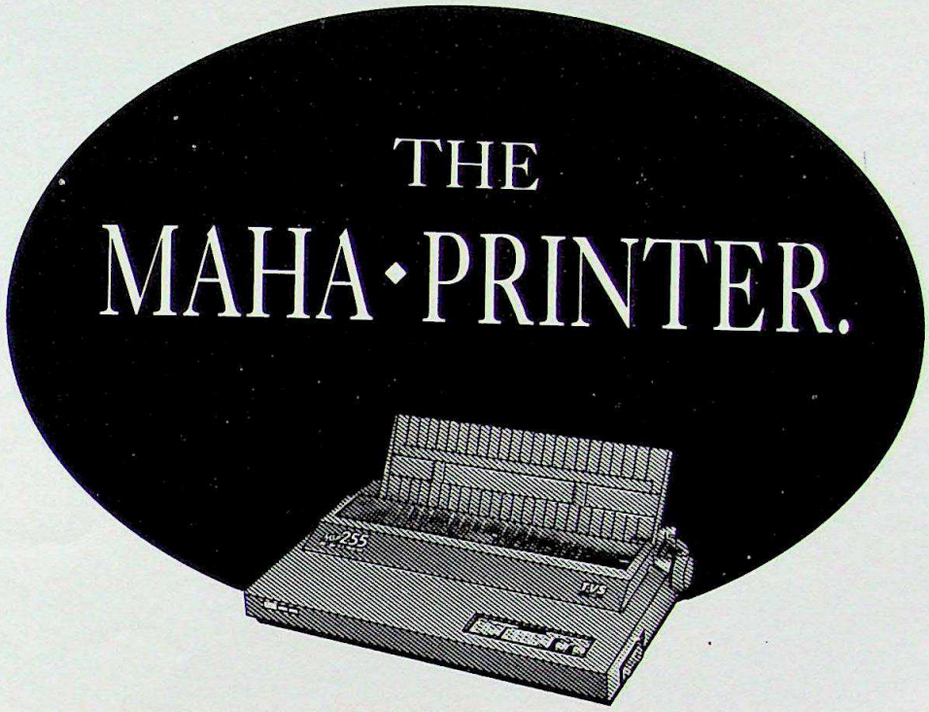
Here "B" stands for bold and the .T. indicates that printing must start on a new line. You can download the Xwrap function from PC Magazine Online. Look for the file XWRAP.PRG.

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```
*************************************************************

* FUNCTION Xwrap                FoxPro for MS-DOS 2.6
* Prints a character string using the STYLE clause.
* Expects _WRAP to be .T., and uses _LMARGIN
* and _RMARGIN to anticipate a word wrap so
* the text doesn't wrap, losing the currernt
* STYLE clause.
*
* Parameter 1 - The string to be printed
* Parameter 2 - A string that defines the STYLE clause. An
*           empty string will default to Normal
* Parameter 3 - .T. to output the string on a new line
*           (?), or .F. to continue on the
*           same line (??). Defaults to .T.

*************************************************************
FUNCTION xwrap
PARAMETER instring, outstyle, newline
PRIVATE nextspace, outstring, fromcol
IF TYPE('outstyle') = 'L' ;
    OR EMPTY(outstyle)
    outstyle = "N"
ENDIF
IF PARAMETERS() < 3
    newline = .T.     && Default to newline if not
            && explicitly .F.
ENDIF
outstring = ""
IF newline
    ?
ENDIF

* In case some text is already on this line
fromcol = IIF(_pcolno > _lmargin, _pcolno, _lmargin)

DO WHILE LEN(instring) > 0
  nextspace = IIF(AT(" ",instring)>0,AT(" ",instring),
  LEN(instring))
  *
    * If the next word would wrap
    *
    IF fromcol + LEN(outstring) + nextspace > _rmargin
?? outstring style (outstyle) AT (fromcol)
    outstring = ""
            ?               && Wrap
            fromcol = _lmargin     && Reset
    ENDIF
  outstring = outstring + LEFT(instring, nextspace)
  instring = RIGHT(instring, LEN(instring) - nextspace)
ENDDO
?? outstring style (outstyle) AT (fromcol)
RETURN
```

FIGURE 1: *Use this function in FoxPro for MS-DOS to send strings to the printer without losing your STYLE clause setting.*

Microsoft concedes that it has no plans to further upgrade the MS-DOS product, at least as of this writing.—*Sal Ricciardi*

Leap Year Recap

The Leapyr function in the column of November 21, 1995, was indeed somewhat long, but your faster technique also seems a bit involved. Why won't the following leap year test do the trick?

```
IF MOD(YEAR(date),4) = 0
    * It's a leap year
ELSE
    * It's not a leap year
ENDIF
```

I know that for some year in the future this divide-by-4 rule won't work, but for now it's simpler.

JOHN A. DIXON,
Grass Valley, California

PC MAGAZINE: There's almost never a good reason to write a routine that will break in the future, even if the future is a long way away. You might make an exception for a true emergency when no alternative exists, but otherwise it's poor form and a bad habit to get into.

A leap year by definition is more than just a year that is evenly divisible by 4. That's why the divide-by-4 logic is no good. A leap year is one that is evenly divisible by 4 and, if it's a century, also divisible by 400. This means 1600 is a leap year because it's evenly divisible by 4 and by 400. But 1700 is not because it fails the 400 test. 2000 is a leap year, but 2100 is not, and so it goes. The simple divide-by-4 logic would erroneously consider 2100 a leap year, and that's only 104 years away! I bet Cobol code will still be running then.

According to legend and the Microsoft Encarta 1996 Encyclopedia, the leap year came about in 45 B.C. when Julius Caesar decided to use a solar calendar. The Julian calendar that resulted fixed the normal year at 365 days and the leap year—every fourth year—at 366 days. The Julian calendar also introduced the order of the months and days of the week as they exist in present-day calendars.

The Julian calendar was slightly longer than the solar year, however, resulting in an accumulated discrepancy that, when corrected in 1582, required 10 days to be dropped from the calendar. (I'd drop the April 15th tax deadline myself.) To try to account for any additional discrepancy, Pope Gregory XIII instituted the Gregorian calendar, which specified that century years would not be leap years unless they were evenly divisible by 400. Today most of the Western world and parts of Asia use the Gregorian calendar.

Which brings us to the function origi published in the issue of November 21:

```
FUNCTION IsLeap
PARAMETER dDate
RETURN !EMPTY(CTOD("02/29/" +
STR(YEAR(dDate))))
```

This is the recommended technique in Pro for checking whether a particular ye leap year.—*Sal Ricciardi*

Readers are invited t send their queries regarding PC usage to the Editor, *PC Magazine India*.

Selected queries wil be answered in the *PC Solutions* department.

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WORD PROCESSING

Sorting Names in WordPerfect and Word

TIP It's easy to sort a list of names in WordPerfect for Windows by first name. Sorting by last name takes a little more work. If every name consisted of only a first and last name, you could easily sort by the second word in the line. But some people use their middle names or initials, such as David N. Dinkins and Hillary Rodham Clinton; some have obligatory titles, such as Sir Anthony Hopkins; and some have titles or other additions after their names, such as F. Lee Bailey Esq. or Hank Williams Jr.

The easiest solution to this problem is to join the trailing Esqs., Jrs., and the like to the last name with a hard space, and then sort by the last word in each line. The hard space acts like another letter in the name rather than a word separator.

Your first step then is to go through the list of names to find the trailing items, and replace the space before each item with a hard space, which you enter with Ctrl-Spacebar. (You may want to use the search-and-replace function if you have a long list.) Next, highlight the list and choose Tools | Sort to open the Sort dialog box. Accept Current Document as both the input and output file, set Sort By to Line, and set the single key definition to Alpha for Type, Ascending for sort order, 1 for Field, and -1 for Word. Choose OK, and WordPerfect will sort the names alphabetically by last name.

Frank C. Yang
Elmhurst, New York

▶PC MAGAZINE: This approach to sorting works as promised but is limited to cases where there is nothing (such as a mailing address or an e-mail address) following the names. A more general solution is to enter the hard space between the first name and middle name or initial, or between the leading title or initial and the first name. You can then define the sort using most of the same settings, except that you'll need to set Word to 2 in the key definition.

You can use the same concept to sort by last name in Microsoft Word for Windows as well, using nonbreaking spaces (WinWord's version of hard spaces), which you enter with Ctrl-Shift-Spacebar.

Start by entering the nonbreaking spaces, just as with WordPerfect, and make sure that each name is in a paragraph by itself. You can then highlight the list of names and choose Table | Sort Text, then Options, to open the Sort Options dialog box. Next, choose Other in the Separate Fields At box and enter a space in the text box next to the Other choice. Then choose OK to return to the Sort Text box. Finally, in the first Sort By box, specify Word 2, Text, and Ascending, and choose OK to sort the names.

In my testing Word did not always display all the choices—Word 1, Word 2, Word 3, and so forth—on the first try. When I closed the dialog box and reopened it, however, the missing choices appeared.—*M. David Stone*

DATABASES

Conditional Text in Access Reports

❓I am a physician, and I'd like to have Microsoft Access generate reminder letters to my patients to call up for their annual appointments. I'd also like to include some text informing those patients with outstanding balances that they have balances due. How can I include the text only for patients with outstanding balances—and not for those who are all paid up?

Jennifer Ziedonis
Decatur, Georgia

▶PC MAGAZINE: The simplest way is to use the IIF function. This function lets you test a condition and returns one of two values, depending on whether the condition is true. The function takes three arguments:

```
Iif(<condition>,<true>,<false>)
```

The first is the condition to be tested. The second is the expression to evaluate and return if the condition is true. And the third is the expression to evaluate and return if the condition is false.

For instance, suppose your letter is stored in an Access report design, and you want to add the outstanding-balance sentence to the end of some existing text. To add it, you normally use the string concatenation operator, &, followed by the

```
="Please call our office at your
earliest convenience to make your
next appointment. " & IIf([Balance],"
"We'd also like to remind you
that you have an outstanding balance
of " & Format([Balance],
"$#,##0.00") & "." ,"")
```

Figure 1: **This Access expression uses an IIF function to place conditional text on a repo Note that it should all be entered on one lin**

text within double quotes. To make text conditional, however, you enclo within an IIF function. Figure 1 show example expression used to fill a text b

In the expression in Figure 1, the minder sentence is only concatenate the existing text if the amount in the [B ance] field is greater than zero. Oth wise, "" is substituted (a null stri which doesn't add anything at all.

Note that Access automatically w the paragraph correctly, whether the ditional text is included or not.
—*Sal Ricciardi*

GRAPHICS

Accurate Line Breaks i QuarkXPress

❓ I work for a prepress company th in the process of changing over to des publishing using QuarkXPress on M At home I have a Quantex DX4-100 and I plan to purchase QuarkXPress Windows. I'd like to be able to wor home sometimes, which would inv moving documents back and forth tween the office Macs and my home

The documents include .TIF and files. It is critical that the line spacing line endings in the document remain same whenever I switch between the and the PC. I've been told I would ne purchase equivalent fonts for my PC the expense would be prohibitive sinc company uses hundreds of fonts. Wi Adobe Type 1 fonts used in the Mac documents translate properly to my P

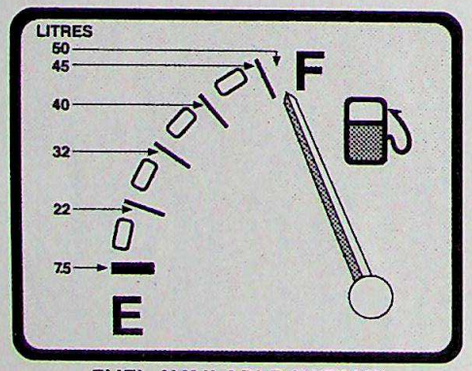
Nancy K
Dubuque,

▶PC MAGAZINE: QuarkXPress offe nary compatibility between its Mac a versions. This means that when you t QuarkXPress document created on a over to Windows, the file will contain

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the words and pictures in the original file—as well as the correct formatting information. But formatting is merely that—a set of instructions that tell Quark which fonts to use when typesetting the copy. The fonts themselves are not embedded into the publication file.

Unfortunately, there is only one way to guarantee absolutely accurate line endings for a wide variety of typefaces: purchase and install identical fonts for your PC. Note that I said *identical*—not equivalent—fonts. Fonts from different type foundries that look similar or that share the same name may actually have different character widths, different x-heights, and different kerning values. Even minor discrepancies in these characteristics can cause dramatic changes to line endings when text is reflowed.

At the moment, you have only one other solution, and it is admittedly deficient. This solution requires that you do only layout work at home—no typography changes are allowed. When you open the Mac document on the PC, QuarkXPress will search your system for the fonts contained in the publication. If it doesn't find the requested typeface, it will present you with the Font Usage dialog box. Instead of substituting new fonts for the missing fonts, simply click on the Continue button. Quark will load the document using whatever font is your current default font. But Quark will not change the Stylesheets, so although the line breaks will be inaccurate on your PC, the text will reflow correctly when the publication is once again opened up on the Mac.

The only way to get accurate line endings when transferring documents between PCs and Macs is to use identical fonts.

Don't give up hope, though. In a few months you should be able to purchase a nearly perfect solution to your problem. The next version of Adobe Type Manager (ATM) will support on-the-fly font substitution using Adobe's Multiple Master technology. Here's how it will work: When you open a file—any file—ATM will look through the fonts installed on your system. If it doesn't find the requested font, it will use a Multiple Master font instead, usually chosen on the basis of whether the original font was a serif or sans serif typeface. The important point is that ATM will use font metric data (that is, read character widths) of the original fonts (it stores this information in it's own internal database) to reshape the substitute Multiple Master font. Though the font won't be identical to the original, all of the line breaks will be preserved. At the moment, only Suitcase ATM, Version 3.8, on the Mac supports Multiple Master font substitution. The current version of ATM for Windows (3.5) is one iteration behind its sibling.

Multiple Master technology does have some shortcomings. In addition to buying ATM 3.*x* ($60), you'll probably have to purchase a few Multiple Master fonts (starting at a list price of $195). Although SuperATM will store the font metrics for a large number of Type 1 fonts (and even some TrueType fonts) it will not contain data for every font on the market. So you may find that an unusual font you use isn't in the database. But even with these limitations, ATM Multiple Master technology promises that you will be able to work on your Mac or PC without duplicating all of the fonts installed on your other Mac. Contact Adobe for more information on the release date at 415-961-4400.

The only other potential problem I foresee concerns the use of pictures in your publications. If you import only .TIF and Adobe-conforming EPS files, you should have no trouble opening the documents on your PC because both TIFF and EPS are platform-independent standards. Avoid .PICT files (which are specific to the Mac) and .BMP files (which are specific to the PC). You may also want to consider importing low-resolution images into your documents for positioning purposes. This will make the file smaller and easier to transport. If you subsequently need to replace the high-resolution images that are stored externally along with the publication, use the "Collect for Output" option in the File menu to gather the publication and all of the relevant pictures into a subdirectory.—*Luisa Simone* □

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Ask Our Advisors

HARDWARE

Two Sides to the Question

The advice you gave in "Shine Your CDs" (Solutions, May 16, 1995) is mostly correct, except that the data is on the label side of the disc, not the shiny side. I found this out the hard way when I marked a new audio CD by scratching my initials on the label side. I'm sure the neighbors heard my shriek when I realized I had trashed half of my new CD!

RANDAL PICK, *via the Internet*

In the Solutions item "Shine Your CDs," the information was not accurate. The data on a CD is just under the label, and laying a CD down on that side quite simply is asking for trouble. While it's true that smudges or scratches on the clear, shiny side tend to cause skipping on audio CDs and loss of data on computer CDs, that side can quite effectively be cleaned, as you noted. But a scratch only a few thousands of an inch deep on the label side is essentially irreparable. (I'm a broadcast engineer and frequently have to clean CDs after the DJs have handled them.)

SAM ASHTON, *via CompuServe*

PC MAGAZINE: These are but two of the many responses I received to the Solutions item offering face-up/face-down advice about CDs. There are at least two sides to the matter.

I think it's safe to say that there's agreement on one point: The best solution is simply to avoid putting an uncovered CD down at all. Put it in a caddy or a jewel case, or even a Tyvek sleeve for a 5.25-inch floppy disk (remember them?) or a business envelope; just don't put it down naked on a hard surface.

Now the question is, when you disobey the edict in the preceding paragraph, should you place the label side down or the shiny side down? There appears to be a genuine difference of opinion on the topic. I made several calls to CD manufacturers, and here's what I discovered.

The data is indeed recorded near the top of the CD. A CD starts out as a thick disc of clear polycarbonate plastic (if I can characterize 1.2 mm as thick), and the data recorded as a series of pits on the top surface of that disc. The top is then covered with a thin, shiny coat of aluminum that, in turn, is protected with a thin coating of lacquer. The label is then printed in ink on top of the lacquer. The laser shines through the bottom clear layer to read the data that is recorded near the top of the disk.

The legions who favor shiny side down do so for a number of good reasons. Minor scratches and smudges on the polycarbonate bottom side probably won't affect the reading of data, since the lens that senses the laser is actually focused on the far surface of the disc. As one source put it, it's like looking through a window screen at the view outside: The wires in the screen may blur your vision, but they don't obscure it. You can polish minor serious scratches out of the bottom side and restore "lost" data. Perhaps the most compelling argument for shiny side down is the fact that a scratch on the label side that penetrates the thin ink, lacquer, and aluminum layers will damage the data pits and obliterate that data permanently.

On the other hand, the polycarbonate plastic is more prone to scratching than the harder lacquer layer, so the label-side-down enthusiasts definitely have a point. A

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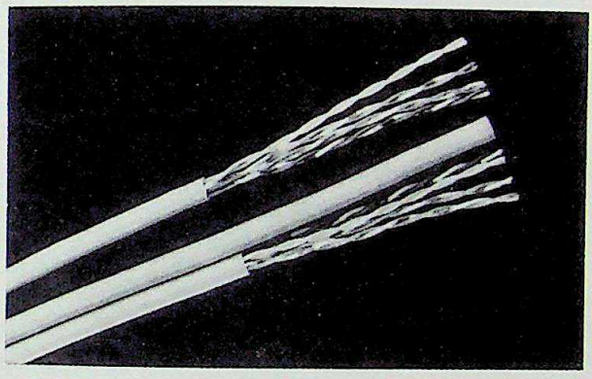
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placing the CD down on the label side means the shiny side is less likely to pick up dust and other debris, which in turn could find its way to the laser or lens.

Since empty jewel cases sell for a pittance, there's little excuse for placing a naked CD on a hard surface in either orientation. But as is so often the case with matters involving human nature and technology, it boils down to a matter of personal opinion and preference. For myself, I'll stick to label-side down for those occasions when I'm too lazy to do the right thing. You now have enough information to make your own decision.—*Alfred Poor*

Memory Lane

I have a 386/33 PC with 8MB of memory and an ISA bus. I also have an ancient ISA memory board with 4MB installed that I salvaged from an old AT. I've been wondering whether I could add this to my 386 and use it as a RAM disk. If so, it would be faster than my hard disk, and setting it up to hold temporary files in Windows would make sense. Is this possible?

ROBERT REITHNER, JR.,
Hoboken, New Jersey

PC MAGAZINE: The idea of making good use out of an older piece of equipment is certainly appealing (especially if you think about how much that board cost when you purchased it), but it's not really a workable idea. Assuming you could install the board and get it to work (given the slower speed of older memory chips), it's unlikely you would be able to specify that particular bank of memory as your RAM disk. And crunching the numbers takes the rest of the steam out of this idea.

The ISA bus is 16 bits wide and runs at 8 MHz. (On your 33-MHz system, it's possible that the bus is actually running at a rate fractionally faster than this, but not enough to have an impact on the results.) The ISA bus has a theoretical maximum data transfer rate of 5 to 8Mb per second, though you rarely see performance this fast.

Early MFM and RLL hard disks had relatively slow maximum data transfer rates of about 600Kb per second and 900Kb per second, so the ISA bus could easily keep up with them. ESDI drives had rates between 1Mb per second and 3Mb per second, and an IDE drive with a 16-bit interface can effectively reach the AT bus 8Mb-per-second maximum. SCSI drives can manage up to 5Mb per second, and SCSI-2 is designed for 10Mb per second or faster. So unless you have an older drive, chances are that it is already just about as fast as a RAM disk running on your 16-bit memory card.

A better bet would be to sell the card and its memory and use the money to add more system memory, if your motherboard can take it. Another 4MB or 8MB of system memory should certainly help Windows performance, and you could also cache more of your hard disk in the faster system memory. This is a better investment than trying to get the old board to work.—*Alfred Poor*

OPERATING ENVIRONMENTS

Dual-booting OS/2 Warp and Windows 95

One question I still have in the OS/2 Warp versus Windows 95 debate is whether or not I can use a dual-boot feature (OS/2 Warp's or Windows 95's) to switch between the two. There is only one right way to make a real choice between the systems—hands on.

Can I somehow set up my computer now with OS/2 Warp's dual boot in preparation for Windows 95, so that I don't have to repartition my hard disk again? Just how would I accomplish this?

JOEL D. CLARK, *via the Internet*

PC MAGAZINE: Investing in a large hard disk really pays off in situations like this. As long as you have the space, you can directly compare the two platforms on your own system. You have the sequence right: You need to install OS/2 Warp first. When doing so, set aside a partition that you will use for Windows 95.

When you install OS/2 Warp, you are asked which partition you want to put it on. If you say you want to change the drive, the FDISK utility appears, allowing you to create a Boot Manager partition. If you already have OS/2 Warp installed, you can run FDISKPM to create the Boot Manager partition and make it startable. The startable partition is the one that takes control when you first turn on your computer.

The partition setup I'm using at the moment is shown in Figure 2. I like to keep programs and data separate from the operating system, so I have an additional HPFS partition for OS/2-only applications, another FAT partition for programs I may run under either OS/2 or Windows 95. Note: OS/2 Warp is quite flexible and doesn't object to being installed in the E: partition.

When you install Windows 95, it will install its own Boot Manager. That's necessary so that the installation program can be sure to regain control when it needs to reboot your system to complete the installation process. When Windows 95 is installed, click on Start, Run, and type FDISK. From the FDISK options menu, select 2 to set the active partition.

You will see a partition list similar to the one in Figure 3. The 2MB partition at the bottom is Boot Manager. (Remember that D: and F: are hidden with the extended partition.) Type the partition number that corresponds to Boot Manager, and the A: under Status will move to that partition. Now press Esc, save your changes, and then reboot. Boot Manager will take control and allow you to choose between Windows 95 and OS/2 Warp.

Warning: If you already have Windows 3.11 installed and are using the red-label version of OS/2 Warp, that copy of OS/2 Warp relies on Windows 3.11 to run Windows applications. If you install the upgrade version of Windows 95 on top of Windows 3.11, you'll lose your Windows application support under OS/2 Warp. Either use the Fullpak or Connect version of OS/2 Warp, or use the full version of Windows 95 in a separate partition.—*Brian Proffitt*

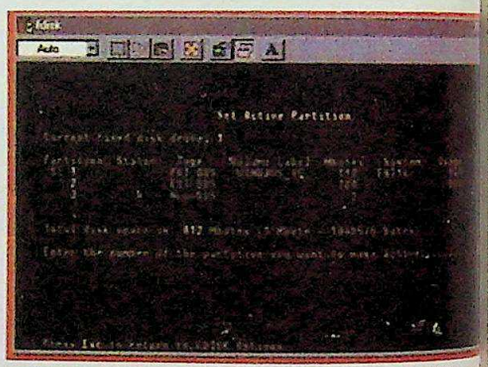


FIGURE 3: *After you've installed Windows 95, use the FDISK utility to make the Boot Manager partition active partition.*

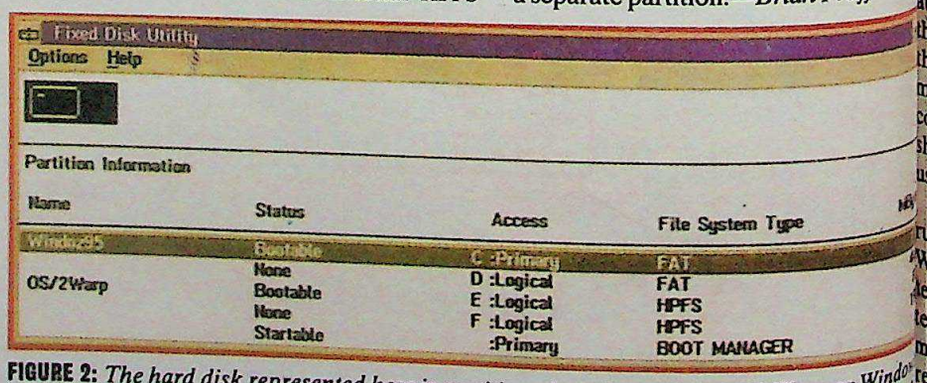


FIGURE 2: *The hard disk represented here is partitioned to allow either OS/2 Warp or Windows to boot. Note that drives have been set up to accommodate both OS/2's HPFS file system and Windows 95's FAT file system.*

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What to Do About Windows .TMP Files

*I'm really confused by Windows 3.1 . TMP files. When I search using the *.TMP mask in File Manager, it finds over 70 files on my disk. By looking at their names, I can tell what application created them, and if I rename one of these files so that its name is recognized by the original application, that application can open the renamed file as if it were a normal file. For example, I renamed ~PM53424.TMP to DUMB .PM5, and Aldus PageMaker 5.0 had no problem opening the file.*

If I keep this search window open in File Manager, switch to Program Manager, and then open PageMaker 5.0 and return to File Manager, File Manager notifies me that the contents of the drive have changed. When I update the search results, I find that another ~PM5XXXX.TMP file has been created. When I quit PageMaker, this file is automatically deleted.

Microsoft Undelete generally recognizes TMP files that have been deleted and, in some cases, allows you to recover them. It's all very confusing, and I'd like to know what the .TMP files are for and whether I can delete them.

CARLO M. CONTRERAS, *via the Internet*

> It's never appropriate to open, modify, or delete a .TMP file while the program that created it is running.

PC MAGAZINE: Rule number one: When Windows is running, leave the .TMP files alone! The reasons for creating .TMP files vary with different applications, but it's never appropriate to open, modify, or delete a .TMP file while the program that created it is running. When the program doesn't need the .TMP file anymore, it should automatically delete it. And of course, when you terminate the program, it should delete all the .TMP files it has been using.

Rule number two: When Windows is not running, delete any .TMP files you can find. When a program ends, it should delete any temporary files it created, but if a program terminates abnormally, or if another program manages to crash the system, .TMP files may remain on your disk. If you find .TMP files after exiting Windows, you can freely delete them. They're just using up valuable disk space. The only time you might want to hold off for a bit is immediately after a system crash that destroyed the files you were working on. In that case, examine the .TMP files right away and rename any that seem to contain data from the destroyed files. Then delete the rest.—*Neil J. Rubenking*

WORD PROCESSING

Using Logos and Letterheads in WordPerfect

We use WordPerfect for Windows 6.0a on our LAN. The company logo is in one 200K .WPG file, and our letterhead is in another file. After the logo and letterhead are inserted, the simplest memo is 250K. Is there any way users can save only the text of their letters but still have the logo and letterhead print?

DAVID WOJCIECHOWSKI, *via CompuServe*

PC MAGAZINE: There are at least two ways to add a logo and letterhead in WordPerfect for Windows without having to save duplicate copies of both with each memo or letter: You can use the Document merge command, or you can set up your memos and letters as master documents.

You'll find the Document merge command in every version of WordPerfect back to at least WordPerfect for DOS 5.1 (which is as far back as I checked). Master documents are also available from WordPerfect 5.1, although the details for using these features vary slightly from one version to another. For simplicity, I'll give step-by-step instructions only for Version 6.0a. (The slight adjustments you'll have to make for earlier releases should present no problem.) I'll also assume that you've put both logo and letterhead in one file, called LOGOLETR.STD, and that it's on the network drive G: in the \WPFILES directory.

To insert the LOGOLETR.STD file with the Document merge command in WordPerfect for Windows 6.0a, open a blank file and choose Tools | Merge to bring up the Merge dialog box. Choose Form, then None when WordPerfect for Windows asks you to specify a data file, and then choose OK. WordPerfect will return you to your blank document, with the merge feature bar showing.

Make sure your cursor is at the beginning of the file and choose Merge Codes from the merge feature bar to open the Insert Merge Codes dialog box. Highlight Document(filename) and choose Insert. Then enter the drive, path, and filename to insert and choose OK. WordPerfect will then insert the code

```
DOCUMENT(G:\WPFILES\LOGOLETR.STD)
```

in your document. Just move your cursor past the code, add a carriage return, and start your memo or letter.

When you're ready to print, you must use the merge command rather than the print command. Choose Tools | Merge, then Merge to open the Perform Merge dialog box. Set the Form File text box to <current document>, leave the Data File text box blank, set the Output File text box to <Printer>, and choose OK. WordPerfect will merge the logo and letterhead into your printed output.

To insert the logo and letterhead in a master document instead, start with a blank document and choose File | Master Document | Subdocument to open the Include Subdocument dialog box. Enter the appropriate drive, directory, and filename, and choose Include. Depending on current settings, either WordPerfect will add a small icon at the left margin of the page (to indicate the subdocument) or it will add the following marker:

```
Subdoc: G:\WPFILES\LOGOLETR.STD
```

Here again, simply add a carriage return and start your memo or letter. When you're ready to print, you'll need to expand the master document so you can see and print the subdocument. Choose File, Master Document, Expand Master. Make sure the check box for the subdocument is checked and choose OK. You can then give the usual File Print command. When you save the file, WordPerfect will ask whether you want to condense it. Answer yes to save the file without saving an embedded copy of the logo and letterhead.

To give you a sense of how much space you can save, I ran a couple of tests with a logo-plus-letterhead file of 15.7K. Inserting the logo in a master document with one line of text and then saving the document without condensing it gave me a 16.3K file. Condensing the master document dropped the size to 2.5K. Using the Document merge command instead yielded an even smaller file—just over 1K. As should be obvious, either approach will save a great deal of disk space, but the Document merge command will save just a bit more.—*M. David Stone*

More on Inserting Merge Fields in WinWord 6

In the Solutions column of June 13, 1995, Dennis J. Varnau pointed out that if you choose the Insert Merge Field button on Word's Mail Merge toolbar and there are too many fields to

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fit on screen, you can't scroll through the list to find a field. You provided another way to insert a merge field, but there's an easier solution: Pressing Alt-Shift-F gives you a scrollable list of merge fields that you can insert into your document.

EDWARD BRUCE,
Falmouth, Massachusetts

PC MAGAZINE: Thanks for the reminder about this command. When you're in a merge document, the Alt-Shift-F combination brings up the Insert Merge Field dialog box, which includes scrollable lists of both merge-related fields and the names of the Merge Fields for data.

Whether this is easier than the approach I suggested is a matter of opinion, though. I find it easier to enter a field by typing its name than by calling up and scrolling through a list. And I find it a lot easier to remember field names than arbitrary commands like Alt-Shift-F. Granted, the F could stand for Field, but I can never remember whether a given command is Alt-Shift-F, Alt-Ctrl-F, or Ctrl-Shift-F unless I'm absolutely consistent about the Alt, Ctrl, and Shift combinations. On my customized copy of WinWord, for example, I reserve Alt-Shift for styles.

I'd argue that Alt-Shift-F is one of WinWord's hard-to-remember commands precisely because it's available only by way of the keystroke command. Unless you're good at remembering arbitrary keystrokes, it's almost useless. You can make it more useful by changing the keystroke, adding an alternate keystroke, or putting the command in a menu.

The command you need to customize is InsertMergeField, which you'll find in the All Commands category in the Customize dialog box. To add the command to a menu, choose Tools, Customize, then Menus. Next, choose All Commands in the categories list box and InsertMergeField in the Commands list box. By default, WinWord will specify the Tools menu in the Change What Menu text box, (Auto) in the Position on Menu text box, and the name &Merge Field in the Name on Menu text box.

Note that the & indicates the letter that will be the trigger key on the menu—in this case, M. Since the Tools | Macros command uses M, you'll want to change the trigger key for Merge Field so you don't have to choose between Merge Field and Macros when you use keystrokes for menu commands. I'd recommend changing the entry to Merge &Field, since nothing on the Tools menu starts with F.

If you accept the other defaults and choose Add, WinWord will add the command to the Tools menu, just below the Mail Merge command. The F will be underlined to indicate that it's the trigger key (the M key will be underlined if you kept the default). You'll also see the current shortcut key assignment on the menu as a useful reminder.

To change the keystroke or to add an alternative, choose Tools, Customize, then the Keyboard tab. Here, too, choose All Commands in the categories list box, and InsertMergeField in the Commands list box. Assuming that the keystroke isn't already customized, WinWord will show Alt-Shift-F as the only entry in the Current Keys list box. If you want to remove this as a choice, highlight it and choose Remove.

To add a new key combination, move to the Press New Shortcut Key text box and type the key combination to be used. I'd suggest a two-key combination using some variation on MF, for Merge Field. If you stay with Alt-Shift for mail merge commands, for example, you can use Alt-Shift-M,F. (By default, Alt-Shift-M is assigned to MailMergeToPrinter, but if you prefer mnemonic keystrokes, you'll need to change that as well—perhaps to Alt-Shift-M,P.)

Don't forget to choose the Assign button before closing the dialog box, or WinWord won't make the key assignment. And don't forget to choose File | Save All when you finish, to make sure your changes get saved to disk.

You'll notice that I did not suggest adding the command to a toolbar. That's because if you do add the command to a toolbar, it installs as another Insert Merge Field button. Instead of opening the Insert Merge Field dialog box, this new button will open the same unscrollable list of merge fields as the original Insert Merge Field button. And that, of course, is the problem we're trying to overcome.—*M. David Stone*

SPREADSHEETS

Excel's Scrolling Region

On most of my Microsoft Excel 5.0 spreadsheets, I can get to the bottom of my entries by dragging the scroll box to the bottom of the scroll bar. On one of my sheets, however, this action takes me to row 1776, even though my bottom-most entry is in a row in the 800s. I assumed (and confirmed with trial) that I had entered and deleted an item in this part of the sheet. Is there a way to tell Excel that by using the scroll bar, I want to get to the bottom of my current entries, not all of the past entries?

DAVID MORGAN, *via CompuServe*

PC MAGAZINE: Just save your file. For scrolling purposes, Excel keeps track of the bottom-right corner of the populated area of your worksheet. When you drag the scroll box to the bottom or right side of the scroll bar, that last populated cell is where you land. (If you want to scroll into unpopulated territory, hold down the Shift key while you drag the box.)

When you erase the bottom-right cell or delete its row or column, Excel doesn't bother to update its scrolling pointers. But it does update them whenever you save. Thus a simple Ctrl-S will keep the scrolling beha as you want it.—*Craig Stinson*

Eliminating an Unnecessary Prompt in Excel

One side effect of having a chart on a sepa sheet from the data in a Microsoft Excel w book (rather than embedded in the worksh is that, whenever the workbook is ope Excel thinks it has been changed. The w book can't be closed—even immediate without producing the question, "S Changes in 'MYFILE.XLS'?" It's a bit ir and possibly confusing, that this prompt pears even when the workbook is stored read-only file. To avoid the prompt, I adde following macro to a module in the workb

```
Sub Auto_Open()
      ThisWorkbook.Saved = True
End Sub
```

This tells Excel that the workbook has alre been saved.

DICK OAKLAND, *Brandon, Wisco*

PC MAGAZINE: A spokesperson for Micro says this is a known bug. Since it's a fairl nocuous bug, the company hasn't go around to fixing it yet. Mr. Oakland's m handles the problem neatly. Setting the S property of the ThisWorkbook object to F clears the file's dirty bit, letting Excel know okay to close without prompting for a s

Usually, when Excel prompts you to sa workbook that you haven't changed, it d so for good reason—because the workb contains one or more volatile formula A volatile formula is one whose value is sub to change on every recalculation. Com examples are formulas involving the NO and RAND () functions. When you open a workbook, Excel recalculates the vol formulas, and if you close without saving get a prompt. If you'd rather avoid prompt, you can do so with Mr. Oakl Auto_Open macro.—*Craig Stinson*

DATABASES

Changing the Microsoft Access Window Caption

Custom applications should look custom applications. With th mind, why not replace the "Micr Access" that appears on the title bar of Access application with a custom title?

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```
'
' Declarations section
'
Option Compare Database   'Use database order for string comparisons
Option Explicit
Declare Function GetParent% Lib "USER" (ByVal hWnd%)
Declare Sub SetWindowText Lib "USER" (ByVal h%, ByVal lpstr$)
Declare Function GetActiveWindow Lib "User" () As Integer

'*********************************************************************
' FUNCTION ChangeAccessCaption (Caption As String)        Access 2.0
' Changes the caption in the title bar of the main Access window
'*********************************************************************
Function ChangeAccessCaption (Caption As String)
Dim hWndAccess As Integer

hWndAccess = GetAccessHwnd()             ' Get the Access hwnd
Call SetWindowText(hWndAccess, Caption) ' Make the API call

End Function

'*********************************************************************
' FUNCTION GetAccessHwnd ()                                Access 2.0
' Returns the handle to the main Access window
'*********************************************************************
Function GetAccessHwnd ()
Dim hWnd As Integer
Dim hWndAccess As Integer
hWnd = GetActiveWindow()     ' First get active window handle
hWndAccess = hWnd
While hWnd <> 0              ' Keep getting parents until
    hWndAccess = hWnd        ' the parent is 0
    hWnd = GetParent(hWnd)
Wend
GetAccessHwnd = hWndAccess
End Function
```

FIGURE 4: *The ChangeAccessCaption() function can be used to change the caption in the title bar of the main Access window*

feature is not built into MS Access, but with a few Windows API calls, it's easy to do.

You can use the ChangeAccessCaption() function listed in Figure 4 in your own code to change the Access window caption. The function uses the Windows API functions GetActiveWindow() and GetParent() to find the Access main window and it uses the SetWindowText() function to change the caption in the title bar.

Note that if another application expects the Access window caption to say "Microsoft Access," you'll confuse it if you change the caption. This is not very likely, however.

ROB MCCORMACK, *Thunder Bay, Ontario, Canada*

PC MAGAZINE: I split Mr. McCormack's original code into the two functions listed in Figure 4, and I modified the ChangeAccessCaption() function to accept the caption as an argument to the function. To try Mr. McCormack's tip, place the code in a module in your Access database. Be sure to put the code at the top of the listing in the declarations section of the module and then create the two functions shown in the figure. Then select the View menu, choose Immediate window, and type in the following:

```
? ChangeAccessCaption("My Caption")
```

You can use the Windows API function SetWindowText() to change the caption of the main Access window—or of any window, for that matter. To do so, however, you must first get the window's handle, which is the job of the GetAccessHwnd() function in the listing. GetAccessHwnd() starts by getting the handle to the currently active window (which could be an Access form, for example), then repeatedly calls the GetParent() function to get the handle of each successive window's parent until it finds the Access window (the one whose parent window handle is 0). Once you have the handle to the main Access window, changing the caption simply requires a call to SetWindowText, passing it the handle and the new cap

To change the Access window caption matically every time you open your data you can create an AutoExec macro. A automatically looks for such a macro wh opens a database. If it finds one, it runs it.

To create the macro, open your data choose the Macro tab in the Database tainer, and then choose New. In the A column, select the first empty cell, then on the arrow, and choose the RunCode m action. You can put an explanatory com in the Comment column if you wish. T place the insertion point in the Fun Name text box at the bottom of the sc and type:

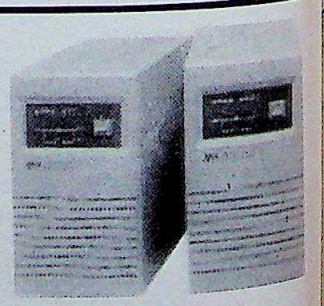
```
ChangeAccessCaption("My Caption")
```

as above. You can, of course, substitute ever text you want for the "My Capt Next, select the File menu, choose Sav and name the resulting macro AutoE This tells Access to call the ChangeAc Caption function whenever you open database. Now close your database. The time you open it, the caption will be cha automatically.

Users of the Microsoft Access Devel Toolkit needn't go through this proce Your application's window caption can b in the Run Time Options section of the cation's . INI file. And you won't need to any code to set the window caption i crosoft Access for Windows 95 (in beta write this), either. Access 95 has data properties that can be set via a menu op one of which is Caption.

You can download the code in Fig from PC MagNet. Look for the file C CAP.AB in the Sol: Spreadsheets/D Forum on the Utilities/Tips Forum.

—*Sal Ricciardi*

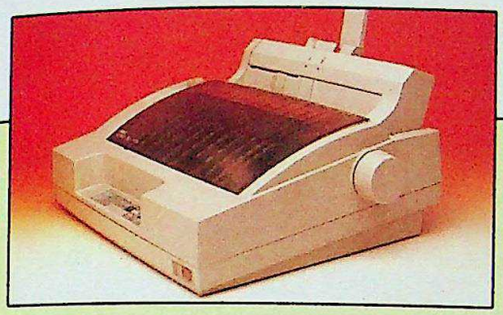

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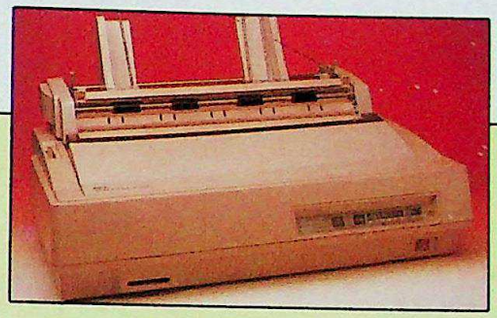
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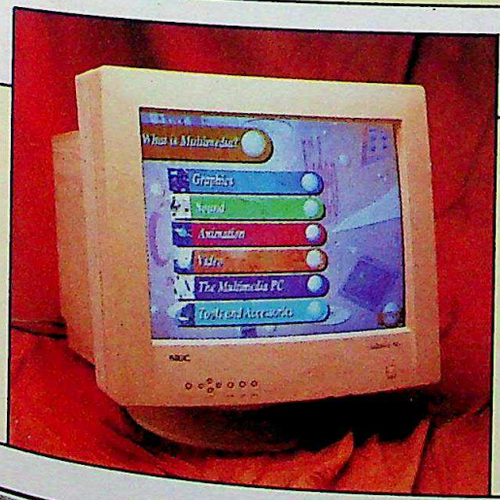
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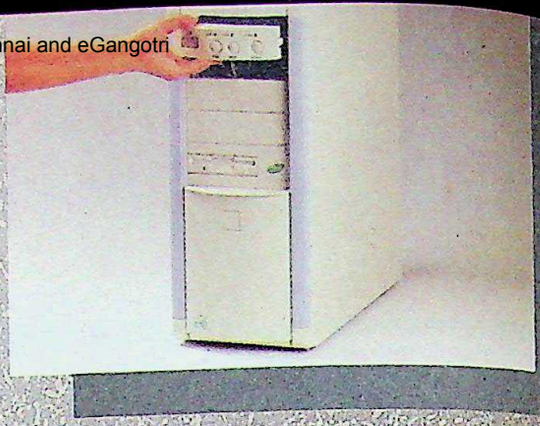
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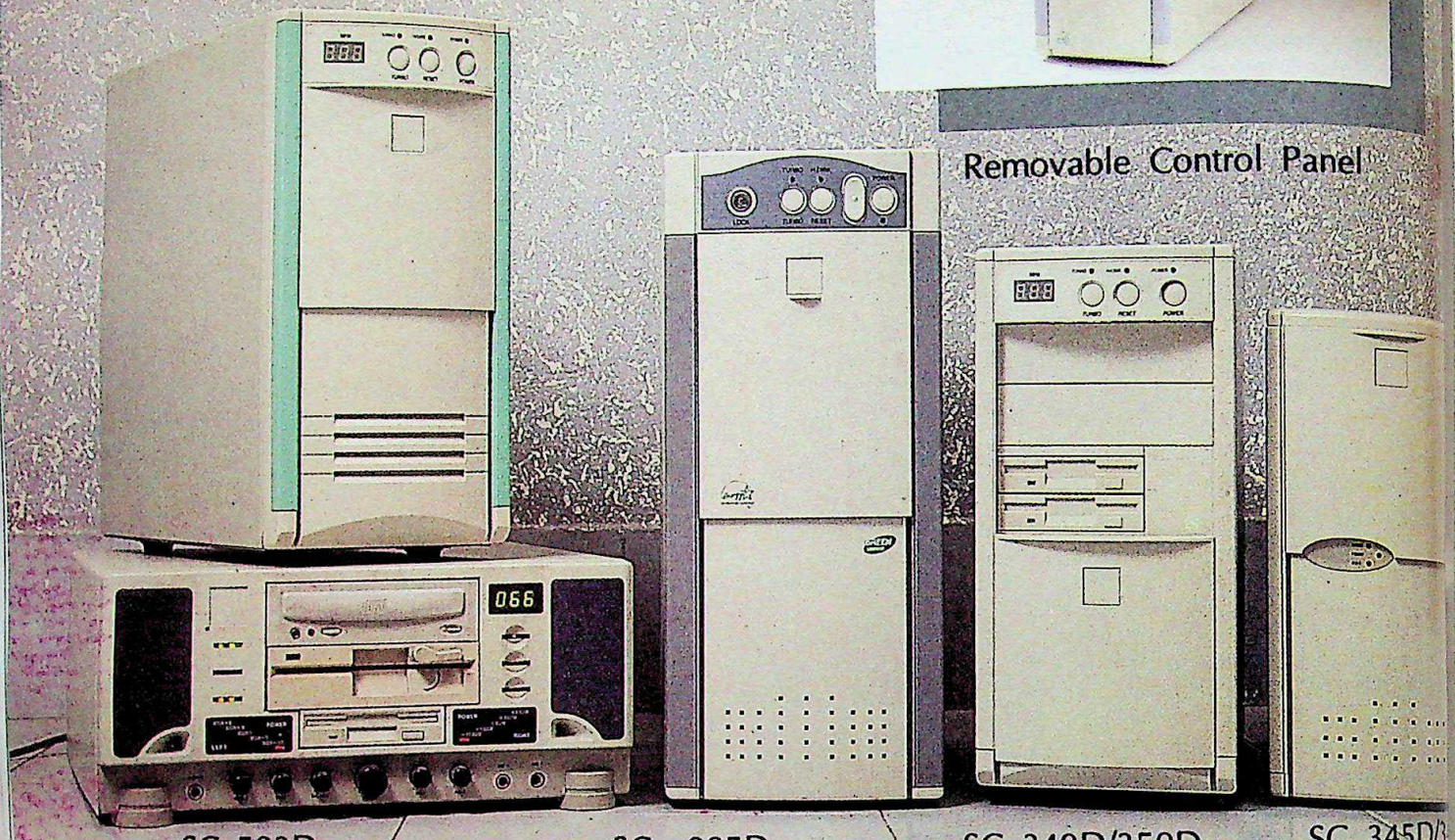
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UPS/CVT:

The Struggle for Power

The UPS/CVT industry has the dubious distinction of being perhaps one of the most unorganized industries in India. Though the industry is quite old, there does not seem to be adequate attempts to put the industry on an even keel. This is exemplified by the fact that the UPS/CVT industry has still not been able to form a national association to represent the industry in dealings with the government and bring up the industry in a scientific and organized way.

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Power Problems, Causes, and Effects 134
Tips for Buying UPS/CVT 138
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UPS/CVT Buyers' Guide 141

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Computer users have broadly been classified into two types: those who have lost data because of power problems, and those who will lose data because of power problems. Beyond the humor and the hype in this classification, there is the plain truth—the inevitability of power problems. These problems may be less in some places, and more in others; but there is no escape from their clutches. A study by IBM has showed that a typical computer is subject to more than 120 power problems per month. In India the figure is much more, depending upon the area. The effects of power problems may range from ordinary, like keyboard lockup and hardware degradation, to catastrophic, like complete data loss or burnt motherboards.

It is not the detrimental effects on computers alone that make power problems so frightful. Other losses may be greater than the cost of the computer itself. A U.S. study has estimated that power problems are the largest cause of data loss, accounting for 45.3%, far above 8.2% contributed by hardware/software error. According to a survey by the Yankee Group, almost 50% of the corporations researched put their downtime costs at $1,000 per hour, while 9% put it at $50,000.

All these facts and figures point to the fact that in the electronics age wherein not only computers but many electronic equipment used for critical applications need a clean and continuous power supply, one just cannot depend upon the public utility for the safe and profitable operation of his equipment and business. This brings us to the domain of UPS/CVT, used extensively all over the world to provide the power supply of the required quality.



Bhurji CVTs are exported to the West and the Far East.

We shall begin the UPS/CVT story in India with Bhurji, the Gurgaon-based giant CVT manufacturer whose product has become almost a legend. It is difficult to say who is the first manufacturer of power conditioner equipment in India—there are many claimants to the coveted position. Bhurji is definitely among the earliest. But what has prodded us to begin the story with Bhurji is not the company's antiquity in the field, but its contribution.

BHURJI'S REACH

The company's managing director, Avatar Singh Bhurji, refused to cooperate with us, saying that as a matter of policy his company does not deal with the media. It took quite some manoeuvring for us to use other channels to get access to information about company. What struck us the most going through the documents of company was the superlative term which companies from the Far East the USA, including the global Amer giant Best, have praised Bhurji C Any company would have benef immensely by using these quotes foreign companies to sell their produ India and abroad. There is no dear companies in India who fi insignificantly small credits give others—credits of doubtful validity confuse potential UPS/CVT buyers get sales mileage. For example, a acclaimed "No.1" UPS/CVT com projects itself the *numero uno* on strength of a magazine rating it as "1 in a UPS/CVT "users' satisfaction sur Another company calls itself "No.1" CVT company because a magazin given one of its products the aw "editor's choice." A third company itself as "No.1" because its turnover wrongly shown to be the highest magazine in a table of UPS manufacturers' revenue. As such

Power Conditioners

Stabilizers: There are various kinds of stabilizers, namely, manual stabilizer, automatic relay-controlled stabilizer, thristor-controlled stabilizer, and servo-controlled stabilizer. All stabilizers use mechanical movements of switches, relays, motors, and so on, which generate heavy spikes. Hence, they are unsuitable for connecting with any sophisticated electronic devices, including computers. Also, manual movements are highly prone to failures.

CVT (Constant voltage transformer): Also called ferror-resonant transformer, it stabilizes voltage without any mechanical movements. The CVT is basically an LC circuit working in saturated core principle under resonance. Its performance depends upon the type of load and power supply frequency. If the load is inductive or capacitive instead of purely resistive, or the incoming AC mains frequency varies, the CVT ceases to be a voltage regulator. CVT provides good protection against surges and spikes, and can be used for computers if the programs running on the computer are not very critical and occasional data loss does not hamper work.

SMPS (Switch mode power supply): This works on pulse width modualtion technology. In this sytem, according to the input voltage variation, corresponding pulses are generated, which are u to control the output voltage. The ou voltage can be constantly maintain within 0.2% as against 2% to 5% CVTs and stabilizers. It provides no p tection against surge, spikes, and no

Offline UPS: This monitors and re ulates the incoming AC power to load. The moment the power goes belo or above the set limits, it transfers load to the inverter, which draws power from the attached batteries. Th is a time-lage between 1 to 15 milli onds when the offline UPS swtiches f main power to the inverter. Offline U entered the international market in 19 and has grown popular for micro a mini computers. It sales are much hig than those of online UPSs.

Online UPS: This is generally con ered to be the ultimate form of po conditioning. It completely isolates load from the power line. It consists rectifier battery chargger, inverter, control circuitry. The rectifier unit c verts AC power to DC, which is fed to inverter. The inverter, with the help of control circuitry, inverts DC back to which is supplied to the load. W power fails, the inverter draws its po from the batteries instead of from rectifier. There is no break in the po supply.

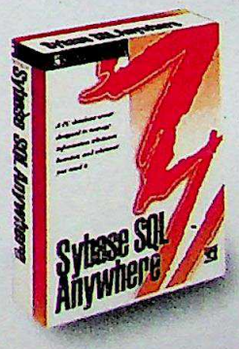
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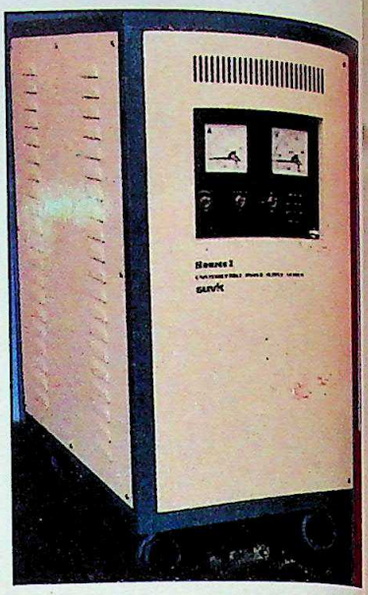
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Power Problems, Causes, and Effects

Events	Causes	Effects
SAGS Also known as brownouts, sags are short term decreases in voltage levels. This is the most common power problem, accounting for 87% of all power disturbances according to a study by Bell Labs.	Typically caused by the start-up power demands of many electrical devices (including motors, compressors, elevators, shop tools, and so on) sags are also the electric utilities' means of coping with extraordinary power demands. In a procedure known as "rolling brownouts," the utility will systematically lower voltage levels in certain areas for hours or days at a time. Hot summer days, when air conditioning requirements are at their peak, will often prompt rolling brownouts.	A sag can "starve" a computer of the power it needs to function, causing frozen keyboards and unexpected system crashes with the end result being the loss or corruption of data. Sags also reduce the efficiency and life span of electrical equipment, particularly motors.
BLACKOUT Total loss of utility power.	Excessive demand on the power grid, lightning storms, ice on power lines, car accidents, earthquakes, and so on.	Loss of current work in RAM or cache, possible loss of hard drive File Allocation Table (FAT) resulting in total loss of data stored on drive.
SPIKE Also referred to as an impulse, a spike is an instantaneous, dramatic increase in voltage. Akin to the force of a tidal wave, a spike can enter electronic equipment through AC, network serial or phone lines and damage or completely destroy components.	Typically caused by a nearby lightning strike, spikes can also occur when utility power comes back on line after having been knocked out in a storm or as the result of a car accident.	Catastrophic damage to hardware. Loss of data.
SURGE A short term increase in voltage, typically lasting at least 1/120 of a second.	High-powered electrical motors, such as air conditioners, and household appliances in the vicinity. When this equipment is switched off, the extra voltage is dissipated through the power line.	Computers and similar sensitive electronic devices are designed to receive power within a certain voltage range. Anything outside of expected peak and RMS (considered the "average" voltage) levels will stress delicate components and cause premature failure.
NOISE More technically referred to as Electro-Magnetic Interference (EMI) and Radio Frequency Interference (RFI), electrical noise disrupts the smooth sine wave one expects from utility power.	Electrical noise is caused by many factors and phenomena, including lightning, load switching, generators, radio transmitters and industrial equipment. It may be intermittent or chronic.	Noise introduces glitches and errors into executable programs and data files.

Courtesy: APC



are any number of "No.1" UPS/C companies in India.

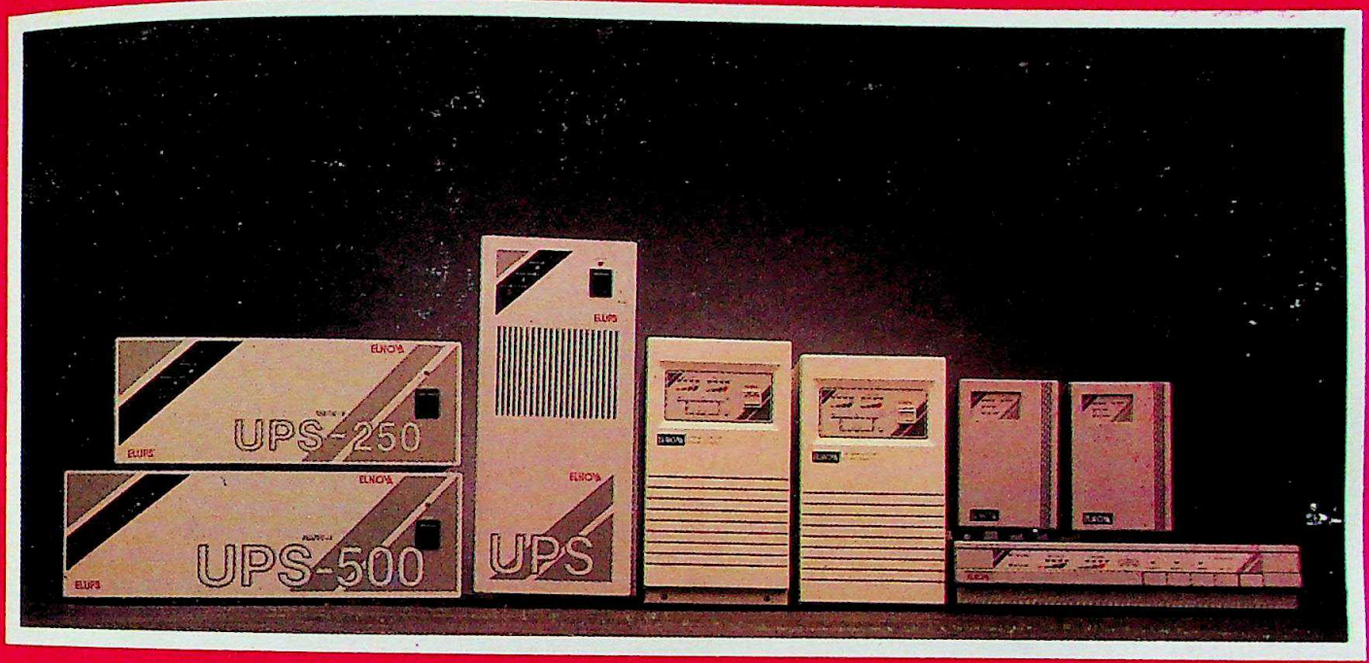
Readers should be beware of claims. First, no magazine in India ha required infrastructure to conduct m ingful surveys of this kind. Second, year some magazines come out with "choices;" so by now we have many panies all occupying the "No.1" slot claiming at the top of their voices that are "No.1" UPS/CVT company. In a where packaging is as important a real thing, one can understand the pulsion of companies to walk on crutches they can lay their hands o the sake of one-upmanship. But one also say that a company conscious dignity and confident of its own prod does not need such certifications others. Bhurji's is a case in point. hardly any advertizing, its CVTs no ride high in the Indian market, but are sold in the Far East and the West, hardly accomplished by most UPS



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R&D facility at Bhurji's Gurgaon plant: Reaching out into export market.

manufacturers. True, a very small number of other UPS/CVT companies have managed to export their products, but these exports are mostly to Russia and Nepal. Exporting to countries like Singapore and USA, as Bhurji does, is an altogether different cup of tea. Aar-em has exported its products to South East Asia. Eltech exports to Singapore, Jordan, Saudi Arabia, and Nepal.

This brings us to a unique phenomenon in the UPS/CVT industry, which has not been generally seen in other industrial segments. Today, media is the message and every company in every industry has been intensively using the media to take its message to the consumer. Even industry leaders commanding more than 50% market share in their respective segments, like Bajaj Auto, Colgate, Maruti, and so on resort to intensive marketing and advertizing to retain their slots. In the UPS/CVT industry, while on one hand we see companies like Elnova and Elent aggressively marketing their products—open any electronics magazine, slick or third-rate, and you'll almost surely find ads of these companies; indeed, they advertize their products even on hoardings, something not normally done by an overwhelmingly large majority of UPS/CVT manufacturers—; on the other hand, there is Bhurji which believes marketing is a waste of time and money. It has no sales team; nor does it advertize its products. Yet, it rules the roost in CVTs, enjoying a near total hold in government and institution market sectors.

STATISTICAL VACUUM

One funny thing about the UPS/CVT industry is that it is operating in a statistical vacuum, with every company having its own ideas about the size of the industry, its growth rate, and the number of players. Let us see how varied are the estimates. S. Narayanmoorthy, director of Lonavala-based Eltech, estimates the size of the UPS/CVT industry at Rs 4.5 billion, the growth rate at 25-30%, with 400 to 500 players in the field. Rajiv K. Poddar, chief executive of Calcutta-based Computer Center, has "no idea" about any of figures, like many UPS/CVT comp we approached. Pune-based Power estimates the size to be Rs 3 billion, rate 30%, and 1,000 manufacturers. based Datex believes the turnover o CVT industry to be only Rs 500 m growth rate 10-15%, and 500 ma turers. H.A. Lakhani, chief execut Gandhinagar-based Suvik, puts the over at Rs 2.5 billion and growth 40%. Bombay-based Kunhar Perip estimates the size at Rs 1 billio growth rate 25-35%. Delhi-based estimates the growth rate at 50% for 96 and at 100% for 1996-97. Anoo partner of Bombay-based Advance tries, puts the growth rate at a 15%, while the Calcutta-based Op dio Electronic estimates the growth UPS industry in 1995-96 at 200%, 1996-97 at 100%. Delhi-based Ad tronics believes there are only 15 CVT manufacturers in India. Int Equipment, again from Delhi, say are just 25 UPS manufacturers in

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Tips for Buying UPS/CVT

General considerations: Check the reputation of the manufacturer, quality of after-sales service, and the manufacturer's commitment to the product. Find out if the vendor is a manufacturer or a dealer or a distributor. If he is a dealer or distributor, find out for how many years he has been dealing in the particular brand of product. Avoid buying from vendors selling many brands in the market. Also, avoid dealers who have been frequently changing their brands. They may not be able to give good backup support. Let not your decision be based only upon price. Size of the unit is an important criterion because space is expensive. If possible get a user's list and check the credibility of the supplier. Note that you don't have to buy a UPS/CVT specified by your computer vendor. But do take his recommendations very seriously to find out which UPS/CVT is the best and most competitively priced for you. Beware of self-acclaimed "No. 1" UPS/CVT manufacturers.

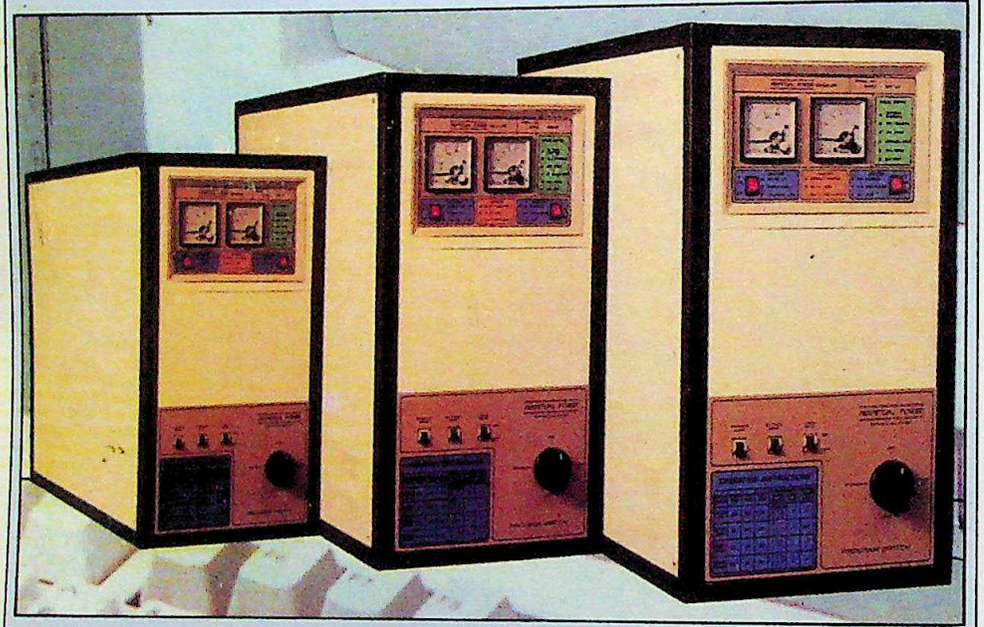
Technical considerations (general): How much power does your equipment need is the most important technical consideration. Buy a UPS/CVT whose rating matches your present requirements, and future expansion plans. Be careful of unscrupulous suppliers who overrate the power capacity of their products and charge you for higher capacity. Test reports or performance certificates can also be checked.

Special technical considerations for CVTs: Do not overrate while specifying the VA rating. CVT provides voltage regulation, isolation, and protection against spikes, surges, and dips in voltage. Unless the CVT has been designed to cater to 4ms energy storage at full power at the lowest operating input voltage, it will not be able to provide protection against dips in incoming supply. Ensure that the manufacturer has given this specification.

Special technical considerations for online UPS: Check the input and output voltage ranges, the input frequency range, and the ability to run on a generator. Common UPSs available in the Indian market use linear power amplification, which is obsolete the world over. This kind of amplification gives a very low efficiency, typically 45%, which means that large and costly batteries are required to run the UPS even for a short period. See whether the noise level is acceptable for the proposed location of UPS. Also ensure that the manufacturer has specified the crest factor.

Special technical considerations for offline UPS: The switchover time from line to battery and from battery to line should be less than 5 ms. Efficiency over 90%, compatibility with generators, use of Mosfet-based inverters instead of transistorized invertors, automatic overload protection, short-circuit proof, wide tolerance for input frequencies are some important considerations. The UPS should preferably have a battery low warning in the form of both flashing LED and an audio beeper. If this facility is not provided, the UPS will switch off without warning when the battery is low, which would defeat the purpose of a UPS.

The output AC wave shape when the UPS is running off batteries should be pulse-width modulated to prevent overheating of the computer power supply.



Power conditioners from Perpetual Power.

These are some specimen answers received when we surveyed the indu... To sum up, the turnover has been esti... ed to be from as low as Rs 500 millio... as high as Rs 4.5 billion, the growth ... from as low as 10% to as high as 20... and manufacturers from merely 2... number to 1,000! The variations ar... too vast to be meaningful statistically. believe that it would be a fairly reason... guess to estimate the size of UPS/C... industry at Rs 2.5 billion, and the gr... rate at 45% for UPS and 30% for CV... Most in the industry would agree ... these figures, with some variations.

To pin down the number of UPS/C... manufacturers is more difficult. The p... lem is compounded by the fact that t... are any number of UPS/CVT manufac... ers conking off within a short period... any number regularly popping out f... nowhere into the industry. This is bec... there is a general perception that ... technology and investment involve... making UPS/CVT is of low level, ... anybody can successfully enter the fie... is a fact that one can begin manufactu... from his backyard with an investme... less than Rs 1 million. But it is also a... that some companies have invested h... ly to make the international grade. B... has invested almost Rs 100 millio... land, plant, and machinery, and has ... 3,000 square yards covered area.

The statistical disarray is prim... because neither DoE has maintained ... statistics about the UPS/CVT industry ... is there any association of UPS/CVT m... ufacturers, which can monitor the in... try and represent its interests. Thi... surprizing. UPS manufacturers hav... ready been around in the country s... early 1980s, and CVT manufacturers ... been there much longer. A very s... association has been coming up in D... which is far from being representa... One reason for no association is tha... vast majority of UPS/CVT manufact... operate in small localised market an... too busy undercutting their local ri... than cooperating with them at nat... level. Another possible reason is th... significant part of the manufacturi... done in the unorganized sector, w... leads to a loss of revenue to the gov... ment in terms of excise and sales tax ... gains to the customer in terms of lo... cost. Even if there were an associa... one fears that the figures may not b... accurate as desirable. There are ... companies which do not manufac...

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Foreign UPS brands (above, Powercom UPS) in the Indian market find increasing applications in MNC plants in India.

Foreign UPS Brands in the Indian Market

Foreign company	Indian partner
1. AMI, USA	United Informatics (P) Ltd, New Delhi
2. APC, USA	Onward Technologies, Bombay; Ritika, New Delhi
3. Best, USA	Powertron, New Delhi (Northern India)
4. Celipower, Taiwan	Spaceage Electro Offiquipments, Calcutta
5. Fiskars, Finland	Next Generation Business Power Systems, New Delhi
6. Fuji Electric Co., Japan	Instrumentation Ltd., Kota
7. High Performance Drives Inc., USA	Numeric Power Systems, Madras
8. Liebert, USA	Tata Liebert, Thane, Maharashtra
9. Merlin Gerin, France	Numeric Power Systems, Madras
10. Powercom, Taiwan	Kunhar Peripherals, Bombay
11. Savin Electronics, Israel	Suvik Electronics, Gandhinagar
12. Siemens, Germany	Guard Electronics, New Delhi
13. Silcon, Denmark	Foresight Power Systems, Bangalore
14. Tripplite, USA	Microland, Bangalore
15. Victron, Germany	Vinitec, New Delhi
16. Viusonic, Japan	Integrated Equipments, New Delhi

roduct sold in the market under their rand name. For example, a self-styled No.1" UPS/CVT company based in Delhi oes not manufacture CVTs at all, but ys CVTs from another self-styled "No.1" PS/CVT company, again from in Delhi, nd sells them under its own brand name. oth the companies include the sales of ese CVTs in their respective sales reve- ues, to falsely prop up their turnover gures. Such double counting will artifi- ally inflate the turnover figures of both e companies and the industry in general.

SSOCIATION NEEDED

ur survey has shown that as the orga- ized sector of the UPS/CVT industry is owing, thanks mainly to the spread of formation Technology, manufacturers are increasingly feeling the need of an association. Delhi-based Ados says "the need for an association is of great importance to lead the industry." Calcutta-based Opto Audio Electronic says "there should be an association for representing the industry and highlighting its problems before the government." Lonavala's Eltech, Calcutta's Spaceage, Faridabad's High-Tech, Pune's Power Guard, Bombay's Kunhar Peripherals, and a large number of other companies have expressed similar thoughts favoring the formation of an association.

With such a plethora of UPS/CVT manufacturers in India, one wonders what is the state of technology of UPS/CVT in the Indian market, and what is the potential of the industry to export and generate foreign exchange for the country. As far as CVTs are concerned, there is hardly any doubt that some branded Indian CVTs in the Indian market are as good as anywhere in the world and can even make the grade in international market. As already stated, Bhurji is exporting its CVTs to the West and the Far East, while other companies are exporting mainly to Russia and Nepal.

Regarding UPS, the scenario is a bit confusing, or rather confusion has been deliberately created by some Indian UPS manufacturers who want to promote their own products. Such UPS manufacturers claim that for Indian conditions made-in-India UPS are better than imported ones. The line of reasoning is as follows: Indian power conditions are among the worst in the world. The variations in amplitude and frequency are higher than anywhere else. Foreign UPS are designed with power conditions abroad in mind, and are not relevant to the Indian scenario. As a case in point, here is what Elnova says, "Indigenous UPS technology is better than foreign ones because their products are designed for the conditions where good and clean power is available, and blackouts/brownouts are rare. Indian-designed products are designed for broader input range, and consumer can backup for 2-3 hours, depending upon the requirement." Delhi-based Ados Electronics adds one more dimension to the projected weaknesses of foreign UPS—"there is absolutely no after-sale support available."

Such pronunciations should be taken

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Technology Trends in UPS

☞*Single conversion:* Single conversion has replaced double conversion. The latter is being used by most Indian UPS manufacturers. Double conversion has two disadvantages. First, it wastes power because parts of circuitry have to be constantly on; second, it is unreliable. In single conversion, a microcomputer inside the UPS decides which parts of UPS circuitry should be on.

☞*Interactivity:* This means interacting with the input line voltage to see what changes are occurring on the input. If these changes are not good, the UPS provides even sub-cycle corrections to the output voltage.

☞*Power management on the network:* This means the UPS begins an orderly shut-down of the computer system. When the input condition deteriorates beyond a certain limit, UPS takes charge of the whole system, and does the entire job that an operator would ordinarily do.

☞*Remote diagnostics:* This means the UPS can signal to a home-based location any abnormal situation warranting the attention of a supervisor at home. On sensing an emergency, the UPS dials the supervisor's pager number through a modem, and the phone rings at the supervisor's home. Hearing the kind of tone the supervisor can know the nature of problem.

☞*Intelligent UPS:* This feature, in essence, makes possible all the above activities, besides many others, which have required human intervention hitherto. The microchip in the UPS imparts to the equipment this quality.

☞*Keeping footsteps with computer power supply:* The UPS is changing in response to the trend in power supply used in computers. Computer power supplies are becoming more efficient, with the wattage requirement equalling VA requirement.

with a grain of salt. One need to stretch his imagination to impossible limits to believe that indigenous UPS technology is "better" than imported ones. Before we offer our reasons to counteract such fallacious claims, let us see what some UPS companies have to say on the subject. Maharashtra-based Tata-Liebert says "indigenous technologies are still age-old and primitive. The catching-up/adaptation to foreign technologies are happening at a very slow rate." Bombay-based Kunhar Peripherals says "indigenous UPS systems are bulky and heavy. Imported UPS use Mosfet-based design whereas in India most of the manufacturers are still working on transistor-based design." Calcutta-based Spaceage says that "India is yet to achieve the desired technology of imported UPS/CVT. Indian companies tying up with foreign companies will bring these technological upgradations to India. Further, owing to cheap labor in India, it will become viable to export UPS/CVT."

Let's face it. Notwithstanding what Indian UPS manufacturers may say to promote their products, Indian UPS technology is way behind. The argument offered that foreign UPS are designed with only foreign power conditions in mind is incorrect. The power condition in developing countries is well known in the advanced countries. When the latter design UPS for exports, they do have in mind the power conditions where their equipment will work. Coming to technology, almost all Indian UPS use double conversion—the technology used when the first UPS was designed in 1970. These UPS suffer from severe design problems. Their rectifier/chargers and inverters have to be sized for constant operation, which is a costly proposition. Moreover, continuously running the inverter means significant energy losses in the form of heat and noise. Because of these reasons in double conversion topology the units are far less efficient and tend to be expensive not only to buy but also to operate and maintain. The UPS in the international market offer efficiency as high as 99%; the best indigenous models will offer about 75%.

Next, the concept of line-interactive UPS, so common in the advanced countries, is foreign here. A modern UPS must interact with the incoming line voltage to compensate for the power anomalies. This is being done by incorporating built-in intelligence into the UPS through a microprocessor.

This microprocessor takes crucial decisions as to when or when not to activate the individual components; thereby, increasing the life of the electronic components and batteries in the UPS.

Technology advances in microelectronics and power semiconductor allow such smooth and fast transfers from line to inverter power that a modern inverter need not remain on all the time. It turns on only when the power goes away. This is the basis of single conversion. The user does not sense any break in power. Single-conversion UPS achieves continuous power without constantly activating the in for power load. This gives not only h efficiency but also higher mean-time tween-failures. These facts, though b ly enumerated, are sufficient to mak point that the Indian UPS industry is much lagging in technology and u components compared to advanced c tries.

USERS, BEWARE!

The prospective UPS buyer must b ware of those Indian UPS vendors claim that their products are "better" imported ones. He must very care ascertain his demands and then d whether an Indian UPS or a foreig will fill the bill. Multinationals co into India after the economic liber tion have brought into the country puterized plants which require extre sophisticated UPS, which are just manufactured in India. As Indian co nies become more and more comp ized, they too will need sophisticated er conditioners. Not surprizingly, w a line-up of foreign UPS in the In market: APC from USA sold by On Technologies, Bombay, and Ritika tronics, New Delhi; Tripplite from sold by Microland, Bangalore; Fi from Finland sold by Business P Systems, New Delhi; Liebert from sold by Tata-Liebert, Thane, Maharas Siemens from Germany sold by G Electronics, New Delhi; Cellpower Taiwan sold by Spaceage Ele Offiquipments, Calcutta; Savin from el sold by Suvik Electronics, Gandhin and so on. *(See relevant sidebar.)*

The fact that foreign UPS are sup to Indian UPS does not mean tha former will wipe out the latter fro Indian market. The need for sophisti UPS is not as widespread as the nee ordinary UPS; but their demand will Some Indian UPS vendors seem unrealistically complacent about the nology they are using, and rest on laurels. Their absolutely absurd cla having "better" technology, and self lation at being crowned "No.1" by x,y,z is unlikely to cut ice for long customers. What the UPS/CVT ind needs is to organize itself, by formi association, and bring in the latest nology, so that Indian customers g best quality product at the best pric

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UPS/CVT BUYERS' GUIDE

By Kishan Chand and Vinod Kumar

(For ready reference we are giving below a list of UPS/CVT companies and their products, along with product prices wherever the companies have given them. The prices given are only indicative, because they may include only some and not all taxes and duties. The turnover of companies are exclusively from the sale of UPS/CVTs, unless otherwise mentioned. It is not our purpose to give an exhaustive list of all UPS/CVTs in India.)

Company	Foreign Tie-Up	T/O (in Rs million) 1994-95/1995-96	Products	Capacity	Price (in Rupees)
EM apoor Building partment 3, IIIrd Floor 39 East of Kailash ew Delhi 110 065 el: 6474538	Nil	—/—	Online UPS	1-50 KVA	—
ar-em Electronics Pvt Ltd IB Hadasar Industrial Estate une 411 013 el: (0212) 672083/672376 ax: 91-212-671413	Nil	Rs 40 mn in 1995	UPS	—	—
argee Industries 312 Electronics Industrial Estate osur 635 109 amil Nadu el: 091-04344/22398 ax: 091-04344/22885	Nil	4 mn/15 mn	UPS	20 VA-10 KVA	200-1.75 mn
DOS Electronics 97 Geeta Colony lhi 110 031 el: 2240495 ax: 91-11-2432381	Nil	3.5mn/5mn (inclusive of T/O from UPS, inverters, and power supplies)	Online UPS Offline UPS 	500 VA 750 VA 1 KVA 1.5 KVA 2 KVA 2.5 KVA 3 KVA 4 KVA 5 KVA 250 VA 500 VA 750 VA 1 KVA 1.5 KVA 2 KVA 2.5 KVA 3 KVA 4 KVA 5 KVA	15,480 20,200 25,500 34,700 48,120 57,500 66,300 84,800 103,800 6,750 7,850 10,680 13,500 18,350 24,750 31,800 37,800 40,200 58,500
M Protection Devices Ltd A/1 Shahpur Jat w Delhi 110 049	Nil	—/—	Offline UPS Online UPS CVT	500 VA-3KVA 500 VA-20KVA 150 VA-5KVA	— — —
rance Industries T1 Tinwala Building huvan Road mbay 400 004 el: 354166	Nil	2.1 mn/2.5 mn (inclusive of T/O from UPS, CVT, servo, and inverters)	Offline UPS CVT	50 VA-5 KVA 25 VA-5 KVA	1,500-65,000 900-52,500

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Company	Foreign Tie-Up	T/O (in Rs million) 1994-95/1995-96	Products	Capacity	Price (in Rupees)
Bhurji Electroniks Pvt Ltd 107 Udyog Vihar Dundahera 122 016 Gurgaon (Haryana) Tel: 0124-343164/65, 341593 Tele/Fax: 0124-341264	Nil	—/75 mn (*PCMI* estimate)	CVT	150 VA-7.5 KVA	—
Cliffs Electronics 331/A1-5/K1 GIDC Industrial Area Makarpur, Baroda 390 010 Tel: 441970/441971/444100 Fax: 441971	Nil	1.5 mn/2.6 mn (inclusive of T/O from UPS, CVT, servo voltage stabilizer, and line conditioner)	Offline UPS CVT	500 VA 625 VA 750 VA 1 KVA Upto 3 KVA 250 VA 350 VA 500 VA 1 KVA	8,500 9,500 12,500 17,000 — 2,500 3,000 3,800 5,000
Computer Center 40E Nimtolla Ghat Street Calcutta 700 006 Tel: 5554429/5337740 Fax: 5554429	Nil	4.8 mn/7.2 mn	UPS Power guard (substitute for CVT)	250 VA 500 VA 750 VA 1 KVA (special prices for UPS with higher backup) 1 KVA 2 KVA (special prices for power guards with auto fax)	5,750 7,750 8,750 10,250 1,250 1,800
Datasafe Power Systems 28 Kilokari New Delhi 110 014 Tel: 6849884	Nil	—/—	Online UPS Offline UPS CVT	500 VA-10 KVA 500 VA-1.5 KVA 500 VA-10 KVA	— — —
Datex Electronics Pvt Ltd T1512/1 Bhism Pitamah Marg Defence Colony New Delhi 110 003 Tel: 4621931/4602457 Telefax: 91-11-4621931	Nil	—/12 mn	UPS CVT	200 VA 400 VA 600 VA 800 VA 1 KVA 1.2 KVA 150 VA 250 VA 350 VA 500 VA 750 VA 1 KVA 2 KVA 3 KVA 5 KVA	7,750 12,500 14,750 17,250 23,000 25,250 (special with ex batteries 2,000 2,500 3,400 4,000 5,800 7,500 13,200 17,500 30,000
Digitelek Systems and Services No. 425, II Cross, Mathikere Bangalore 560 054 Tel: 3374465 Fax: 3374465	Nil	1.5 mn/2 mn	Online UPS Offline UPS	500 VA-15 KVA 500 VA-5 KVA	— —
Electronic Appliance 7/687 Suja, Nana Taiwad Maulana Azad Road Valsad 396 001 Tel: (0263) 54025/53576	Nil	—/—	Online and offline UPS CVT	500 VA-5 KVA 150 VA-3 KVA	— —

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High-performance servers need high-performance power protection

APC Smart-UPS® provide clean, reliable power for systems like Compaq servers.

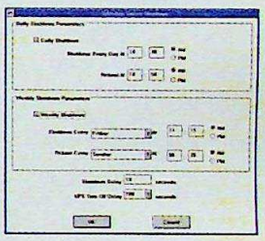


600VA, 1250VA and 2000VA rack mount models also available.

Power problems are the single largest cause of network data loss. Which is why high-performance computers like Compaq's ProLiant server rely on APC. In fact, APC UPSs protect more networks worldwide than any other brand.

For a fraction of the cost of a Compaq server, you can have complete protection from hardware and data-damaging surges, sags and blackouts. Smart-UPS employ the industry's most efficient, reliable Line-interactive design and SmartBoost brownout correction, which extends battery life.

During an extended power loss, PowerChute *plus* software automatically conducts a safe system shutdown *before* the UPS's batteries are exhausted and, when power returns, reboots the system.



PowerChute *plus* also makes UPS management easy. You can schedule daily or weekly UPS self-tests, server shutdowns/reboots. From your workstation you can also manually conduct UPS tests, configure UPS settings, shut down/reboot servers and diagnose power problems. New FlexEvents allows you to preset responses to problems, including "page users." Many network management systems like Compaq's Insight Manager allow you to gather valuable UPS information such as temperature, load and runtime from UPSs on your WAN.

Find out today how Line-interactive Smart-UPS and PowerChute plus management software deliver the power protection demanded by high-performance systems like Compaq servers.

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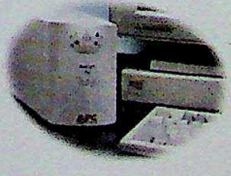
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Company _____
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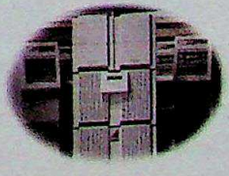
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Company	Foreign Tie-Up	T/O (in Rs million) 1994-95/1995-96	Products	Capacity	Price (in Rupees)
Elent 67 Okhla Industrial Area Phase I, DSIDC New Delhi 110 020 Tel: 6810515/8608 Fax: 6841164	Nil	—/52 mn (*PCMI* estimate)	Online UPS Offline UPS CVT	— — —	— — —
Elincon Electronics Pvt Ltd 4319/3 Ansari Road Darya Ganj New Delhi 110 002 Tel: 3274928/3261773	With a Taiwanese company	—/—	UPS CVT	600 VA 1.25 KVA —	— — —
Elnova Ltd B165 Okhla Industrial Area Phase I New Delhi 110 020 Tel: 6810172/6810569 Fax: 91-11-6811667	Nil	—/82 mn (*PCMI* estimate. The company claims a higher T/O, but has not been able to produce any documentary evidence in support of its claim, inspite of repeated reminders)	Online UPS Offline UPS CVT	1 KVA 2 KVA 250 VA 500 VA 750 VA 1 KVA 50 VA-5 KVA	(with b... for 25 mi... backup fo... 44,000 82,000 11,100 12,300 19,890 21,600 1,270-2...
Elsine Systems Pvt Ltd 840 Chirag Delhi New Delhi 110 017 Tel: 6462300/6446380 Fax: (011) 6449775	Nil	—/—	Online UPS Offline UPS CVT	500 VA-10 KVA 300 VA-1 KVA 50 VA-10 KVA	— — —
Eltech Electronics and Telecommunications Ltd 63B Industrial Estate, Nangargaon Lonavla 410 401 Tel: 73825/73908/73909 Fax: 73875	Nil	56 mn/62 mn (inclusive of T/O from UPS and inverters)	UPS	750 VA 1 KVA 1.25 KVA 1.5 KVA 2 KVA 2.5 KVA 3 KVA 3.5 KVA 4 KVA 5 KVA 6 KVA 7.5 KVA 10 KVA 15 KVA 20 KVA	21,500 23,500 27,000 31,500 40,100 48,000 54,000 58,000 61,300 78,100 86,500 97,000 156,000 215,000 275,600
Foresight Power Systems Ltd 63/1 Railway Parallel Road Kumara Park, West Bangalore 560 020 Fax: 3345791	Silcon, Denmark	—/—	Online UPS Offline UPS	3-3,000 KVA 300 VA-2 KVA	0.3 mn-5... 8,000-40...
Guard Electronics FIEE Okhla Industrial Area Phase II New Delhi 110 020 Tel: 6849337/6849338/6849341	Siemens, Germany	24 mn/41 mn	Guard offline UPS Guard online UPS Nexus UPS Cybex CVT	100 VA - 1.25 KVA 500 VA-6 KVA 375 VA-1.25 KVA 150 VA-5 KVA	6,950-14... 17,300- 123,000 8,750-22... 1,825-29...
Hind Rectifiers Ltd Lake Road, Bhandup Bombay 400 078 Tel: 5642432/5678027 Fax: 5644352/5644114	Nil	—/—	UPS CVT	— —	— —

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Company	Foreign Tie-Up	T/O (in Rs million) 1994-95/1995-96	Products	Capacity	Price (in Rupees)
Hitech Power Systems 24A, Sector II Faridabad	Nil	—/15 mn (inclusive of T/O from UPS, CVT, and inverters)	Online UPS	1 KVA	26,990
				1.5 KVA	36,900
				2 KVA	45,900
				2.5 KVA	55,900
				3 KVA	66,900
				3.5 KVA	75,900
				4 KVA	85,900
				5 KVA	109,900
				7.5 KVA	169,900
				10 KVA	225,900
			Offline UPS	150 VA	5,500
				350 VA	5,990
				500 VA	6,990
				625 VA	7,990
				1 KVA	11,990
				1.5 KVA	15,990
				2 KVA	20,990
			CVT	100 VA	1,000
				150 VA	1,500
				250 VA	2,200
				350 VA	2,800
				500 VA	3,500
				750 VA	5,500
				1 KVA	6,800
				1.5 KVA	9,900
				2 KVA	12,500
				2.5 KVA	14,500
				3 KVA	16,900
ICEM 102 Red Rose Building Nehru Place, New Delhi 110 019	Nil	—/—	UPS CVT	150 VA-10KVA —	Up to 5 —
Instrumentation Ltd 7th Floor, Core 6, Scope Complex Lodi Place, New Delhi 110 003 Tel: 4360101/4361014/4364605 Fax: 011-4360905	Fuji Electric Co. Japan	75 mn/115 mn	UPS	1-10 KVA 10-200 KVA	— —
Integrated Equipments (P) Ltd 1522 Ansal Tower 38 Nehru Place New Delhi 110 019 Tel: 6462300/6214702 Fax: 011-6846815	Viusonic, Japan	21 mn/43 mn	UPS	600 VA	19,000
				1 KVA	45,000
				2 KVA	68,000
				3 KVA	140,000
				5 KVA	225,000
				7.5 KVA	330,000
				10 KVA	351,000
				Up to 25 KVA	Up to 7
Keptron Powertronics E2 Lajpat Nagar I New Delhi	Nil	—/—	Online UPS Offline UPS CVT	1-30 KVA 1-1.5 KVA —	— — —
Kunhar Peripherals Pvt Ltd A23 Shri Ram Industrial Estate 2/F, 13 GD Ambedkar Road Wadala Bombay 400 031 Tel: 4130442/4130646 Fax: 91-22-4130218	Powercom, Taiwan	23 mn/34 mn	Online UPS	1 KVA	45,000
				1.25 KVA	50,000
				2 KVA	75,000
				3.75 KVA	135,000
				6.25 KVA	250,000
				Up to 15 KVA	—
			Offline UPS	250 VA	6,500
				400 VA	11,500
				425 VA	12,000
				600 VA	15,000
				650 VA	15,000
				800 VA	18,000
				1.2 KVA	25,000
				Up to 2 KVA	—

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Company	Foreign Tie-Up	T/O (in Rs million) 1994-95/1995-96	Products	Capacity	Price (in Rupees)
Linear and Digital Systems Pvt Ltd New Delhi 110 064	Nil	—/—	Online UPS Offline UPS	Up to 10 KVA Up to 3 KVA	— —
Logicstat International Pvt Ltd 114 Hemkunt Chamber 89 Nehru Place New Delhi 110 019 Tel: 6484300/6476148	Nil	—/—	CVT	150 VA 250 VA 350 VA 400 VA 500 VA 750 VA 1 KVA 1.5 KVA 2 KVA 3 KVA 4 KVA 5 KVA 7.5 KVA	1,860 2,525 3,100 3,500 4,200 6,000 7,500 9,900 13,000 18,000 25,000 30,000 48,000
Next Generation Business Power Systems Ltd Next Generation House Gulmohar Park Club Road 176 Gautam Nagar New Delhi 110 049 Tel: +91-11-6965645/6859256/57 Fax: +91-11-6963559/6883629	Fiskars, Finland	50 mn/120 mn	UPS	250 VA- 3,000 KVA	7,000-20 mn
Numeric Power Systems Ltd 53 Dr Radhakrishnan Salai Mylapore Madras 600 004 Tel: 4990300/4993266 Fax: 91-44-4995179	High Performance Drives Inc., USA Merlin Gerin, France	—/288 mn	UPS	500 VA- 4,800 KVA	9,50 0 upwards
Opto Audio Electronic Products Pvt Ltd 71 Sourin Roy Road Calcutta 700 034 Tel: 4687297 Fax: 4680430	Tata Liebert (Emerson)	—/9 mn	UPS CVT	— 50 VA-1 KVA 2 KVA 3 KVA 4 KVA	— 1,300-6,000 10,300 19,500 21,500
Perpetual Power Technologies Pvt Ltd 12A, Ist Floor 80 Ft Road, Indiranagar Bangalore 560 038 Tel: (080) 5254315/5297706 Fax: (080) 5297706/5537056	Nil	35.9 mn/100 mn (inclusive of T/O from UPS and power supplies)	Online UPS (using MOSFETS) Online UPS (using IGBTs)	500 VA-15 KVA 5-400 KVA 5 KVA	— — 23,500
Power Guard Systems Pvt Ltd Unit No. 35, S. No 17/6 Continental Industrial Complex Kothnal Industrial Estate Pune 411 029 Tel: 348430	Nil	7 mn/8.5 mn	Online UPS Offline UPS CVT	500 VA-15 KVA 250 VA-2 KVA —	— — —
Prasar Systems (P) Ltd 31 East of Kailash New Delhi 110 065	Nil	1.3 mn/1.6 mn	Online UP'S	500 VA 1 KVA 2 KVA 3 KVA 5 KVA Up to 15 KVA	15,000 28,025 47,025 70,775 123,025 —
Rika Electronics Pvt Ltd B-5 Okhla Industrial Area Phase I, New Delhi 110 020 Tel: (011) 6819362/6817981	Nil	—/—	Line voltage regulator (Equivalent of CVT)	500 VA	—

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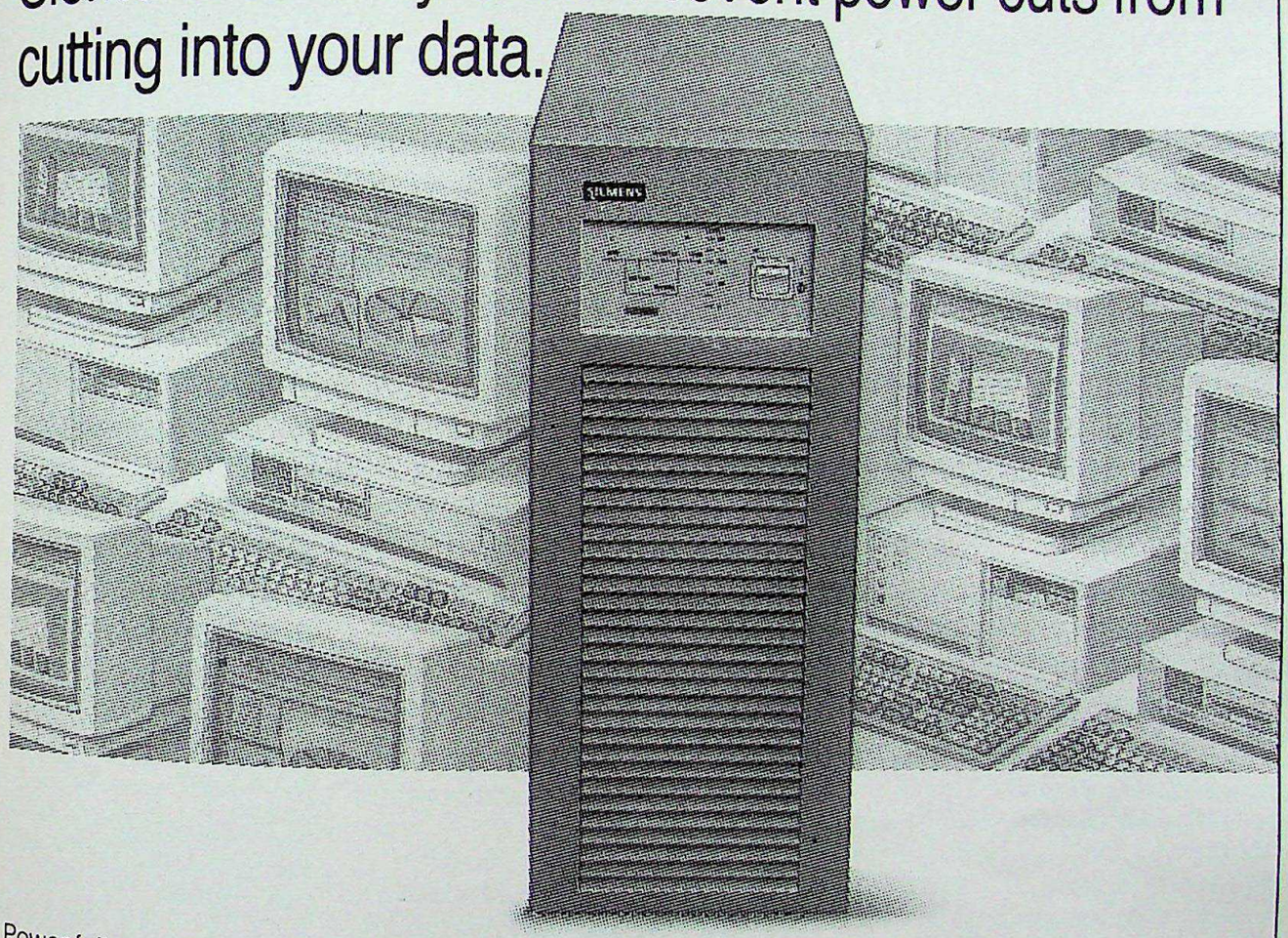
Company	Foreign Tie-Up	T/O (in Rs million) 1994-95/1995-96	Products	Capacity	Price (in Rupees)
Sainik Electronix R16 Inderpuri New Delhi 110 012 Tel: 5737836	Nil	—/—	UPS	Up to 3 KVA	—
Shashvat Electronics Pvt Ltd D84 Okhla Industrial Area Phase I New Delhi 110 020 Fax: 91-11-6813245	Nil	—/2.7 mn	UPS CVT	100 VA-5 KVA 100 VA-5 KVA	— 1,305-27,5
Sinewave Pvt Ltd B148 Okhla Industrial Area Phase I New Delhi 110 020 Tel: (91) (11) 6814050 Fax: (91) (11) 6814531	Nil	—/—	CVT	100 VA 150 VA 150 VA 250 VA 350 VA 500 VA 750 VA 1 KVA 1.5 KVA 2 KVA 2.5 KVA 3 KVA 4 KVA 5 KVA	1,425 1,600 1,750 2,300 3,000 3,900 5,500 6,500 8,800 12,000 15,000 18,000 22,000 28,000
Spaceage Electro Offiquipments (P) Ltd 16 Ganesh Chandra Avenue Calcutta 700 013 Tel: 275761/5975 Fax: 033-275761/5975	Cellpower Co. Ltd, Taiwan	—/14 mn	Online UPS UPS+ AVR+ SW protector	1 KVA 2 KVA 3 KVA 5 KVA 7.5 KVA 10 KVA Up to 120 KVA 400 VA 600 VA 1.2 KVA 1 KVA 1.5 KVA	43,500 73,000 116,000 240,000 427,000 460,000 — 11,000 16,000 25,000 29,000 37,500
Suvik Electronics Plot 102, GIDC Engineering Estate, Sector 28 Gandhinagar 382 028 Gujarat Tel: 22584/22745/22680/22687 Fax: 02712-20112	Savin Electronics, Israel	15 mn/22.5 mn (inclusive of T/O from UPS, servo voltage regulators, power conditioners, and chargers)	Savin UPS Suvik Online UPS Suvik offline UPS	250 VA-2.4 KVA 500 VA 1 KVA 2 KVA 3 KVA 4 KVA 5 KVA 350 VA 500 VA 700 VA 1 KVA	— 19,000 31,000 50,000 65,000 75,500 90,000 9,750 90,000 15,500 20,000
Tata Liebert Ltd Plot No. C20 Road No. 19 Wagle Industrial Estate Thane Maharashtra 400 604	Liebert, USA	270 mn/400 mn	Offline UPS Online UPS	250 VA-2 KVA 600 VA-20 KVA UPS up to 4,800 KVA	8,940-87 35,500- 560,000 —
Vinitec Electronics Pvt Ltd H33 Bali Nagar New Delhi 110 015 Tel: 5194676/535039	Victron, Germany	—/50 mn	UPS Alpha series M series MIT series	 1-15 KVA 1-2 KVA 1-2 KVA	70,000- 45,000- 52,000-

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SIEMENS

Siemens UPS Systems: Prevent power cuts from cutting into your data.



Power failures can cause unsecured data to be lost forever.

The solution: UPS from Siemens which comes with a host of unmatched features like high cost effectiveness, reliability, user friendly technology and round-the-clock after sales service.

Personal computers, workstations, minicomputers, LANs and point of sale systems are a few areas where this highly versatile system finds application.

Siemens UPS range includes:

- B40 CP 0.5 – 6KVA
- B41 5 – 30KVA
- B42 10 – 500KVA

For more information, please contact Siemens Ltd., MDU/M-UPS Division at:

• **Mumbai:** 1086, Appasaheb Marathe Marg, Prabhadevi, Mumbai 400 025. Tel: 4301548, Fax: 437593. • **Ahmedabad:** Shanti chambers, 1st floor, Navarangpura, Ahmedabad 380 009, Tel: 429803, Fax: 469103. • **Calcutta:** 6, Little Russel Street, Calcutta 700 071, Tel: 2478374, Fax: 2474783. • **New Delhi:** 4A, Ring Road, I. P. Estate, New Delhi 110 002, Tel: 3318144/7152, Fax: 3314178. • **Madras:** 144, Uttamar Gandhi Road, Madras 600 034, Tel: 827 3275/7734, Fax: 8255731. • **Bangalore:** Jyothi Mahal, 3rd floor, 49, St. Mark's Road, Bangalore 560 001, Tel: 2272101, Fax: 2272418. • **Secunderabad:** 9-1-87/119/2, St. John's Road, Secunderabad 500 025, Tel: 802552, Fax: 802951. • **Coimbatore:** 10G, 1st floor, SFI Apartments, Satyamoorty Road, Ram Nagar, Coimbatore 641 009, Tel: 230 908, Fax: 230908. • **Chandigarh:** SCO 68-69, Sector 8-C, Madhya Marg, Chandigarh 160 018, Tel: 41208/544829, Fax: 544829.

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Some More UPS/CVT Manufacturers

Adtech Power Systems Ltd
TC 9/908 Sasthamangalam
Trivandrum 695 010
Tel: 68462/69445
Fax: 69456

Albit Electronics (P) Ltd
B20 Basement, Shakti Nagar Extension
Delhi 110 052
Tel: 7218038/7428038/7428039
Fax: 7419039

Alltek UPS
Masjid Road, P.B. No. 77
Alwaye 683 101
Tel: 23946

Alpha Zee Controls & Systems Pvt Ltd
1st Floor Ebrahim's Residency
98 Residency Road
Bangalore 560 025
Tel: 2219245

Amara Raja Power Systems
Renigunta Cudappah Road
Karakambadi
Tirupathi 517 520
Tel: 75561/75562
Fax: 75360

Artech Power Products Ltd
Anitha, 1st Floor
Ernakulam
Cochin 682020
Tel: 318714/318715
Fax: 317793

Bull Power Systems Pvt Ltd
6-3-347/1A Dwarakapuri Colony
Punjagutta
Hyderabad 500 482
Tel: 224250/318265
Fax: 394074

Classic Power Systems
7 Garhi, East of Kailash
New Delhi 110 065
Tel: 2107336/6217337
Fax: 6237317

Continental Power Systems
1 Villa Maria, 24 Wheeler Road
Extn. St. Thomas Town
Bangalore 560 084
Tel: 565898

Digital Power Systems
31 Railway Colony, 3rd Street
Aminjikarai, Madras 600 029
Tel: 425197/4831426

Elcot Power Controls Ltd
4/197, Phase II, Dr VSI Campus
Thiruvanmiyur
Madras 600 041
Tel: 4925115/4925564
Fax: 4925564

Kirloskar Electric
Unit IV, Balavadi Industrial Area
Mysore
Tel: 424522/42540-43
Fax: (0221) 4266/42008

Microsys
Chandraat, 99 Mayur Colony
Kothrud
Pune 411 029
Telefax: (0212) 344167/364355

Orchid
R164, Greater Kailash I
New Delhi
Tel: 6436955/6479386

Pace Electronics
7 Swastik Society
Gulmohar Road
Bombay 400 058
Tel: 6103907/6115995/6126130
Fax: (022) 6116031

PC Power Technologies
C2 Kalkaji
New Delhi 110 019
Tel: 6466830

Power Control Systems
C92 Karampura
New Delhi 110 015
Tel: 532827

Power Electronic Equipment
D214, Sector 10, Noida 201 301
Tel: 35496/55316
Fax: 51622

Power Instruments Control
7 Vishwanathan Street
West Mambalam, Madras 600 033
Tel: 8278964

Power Pack Manufacturing
Power Pack House
RZ 2056/27 Tughlakabad Extension
New Delhi 110 019
Tel: 6983708/6980131, Fax: 6980131

Power Systems
433 Vasant Kunj, Sector A, Pocket C
New Delhi 110 030
Tel: 678985/6893729

Powertron Products (P) Ltd
G104 Kalkaji
New Delhi 110 019
Tel: 6420206/6429714/6481790
Fax: 6429714

Premier Ziba (India) Pvt Ltd
211-212 DSIDC Complex
Phase I
Okhla Industrial Area
New Delhi 110 020
Tel: 634353

Quantum Power Systems
No. 56 Main Channel Road
Ist Floor, Ulsoor
Bangalore 560 008
Tel: 5540666

Radiant Power Systems Pvt Ltd
84 Khijrabad
New Friends Colony
New Delhi 110 065
Tel: 6835523/6919387/6918908
Fax: 6918908

Safe Power
Value Point
304 Bajaj House
III Floor
97 Nehru Place
New Delhi 110 019
Tel: 6470708/6484404

Sam Power & Systems Pvt Ltd
237-240 BR Complex
13th Cross
Indira Nagar
IInd Stage
Bangalore 560 038
Tel: 565890/569435
Fax: 5592016

TVSE
10B, Phase I
Peenya Industrial Estate
Bangalore 560 058
Tel: 8395000/6334

Uniline Electronics Pvt Ltd
B236 Greater Kailash
New Delhi 110 048
Tel: 6423270/6467661
Fax: 91-11-6481469

Vega Electronics & Controls
21 New Alkapuri Society
Gulabi Tekra
Ahmedabad 380 015
Tel: 403774
Fax: 009-79-6423239

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MARKET

Infosys Registers Impressive Growth

Bangalore-based Infosys Technologies (ITL) recorded a turnover of Rs 934.1 million for the year 1995-96, registering a growth rate of 62% over the previous year's turnover of Rs 577 million. The company has recommended a total dividend of 50% for the year ending March 31, 1996.

Operating profits grew faster than growth in gross revenues to Rs 339.5 million from Rs 198.6 million in the previous year, a growth rate of 71%. For 1995-96, Infosys has made several changes to its accounting policies pertaining to the depreciation of computer equipment, the encashment of leave by employees, and the carrying cost of current investments. Due to these changes, there was an extra charge of Rs 77 million to the revenue account. Even after these provisions, profit-after-tax (PAT) increased to Rs 210.1 million, resulting in a growth of 58% over the PAT for 1994-95.

The board of directors recommended a final dividend of 35% over the 15% interim dividend, taking the total dividend to 50% for the year. The total dividend for the previous year was 45%.

According to N.R. Narayana Murthy, CMD, ITL, "1995-96 has been another significant year of achievement at Infosys. Several of the strategies and initiatives that we implemented in the last few years have begun to bear fruit. We are well positioned to meet our goal of achieving sales of US $ 100 million by the year 2000."

During the year, the organization was restructured into several strategic business units (SBUs) to create multiple growth impulses. Several new products and services made their debut. In 2000, a service aimed at solving the millennium data problem, was successfully launched. INLEGOE (The Infosys Legacy and Open Systems Environment Architecture Tool) is being used in several software development centers. BANCS 2000, the total bank automation package, continues to expand its markets and has gone global. *Yantra*, a wholly-owned subsidiary of Infosys was set up in Boston, USA, with an investment of US $ 500,000. Yantra has already signed its first contract and has got off to a good start.

During the year, Infosys set up a development center in Mangalore, and geared up to start another in Pune.

Silicon Graphics Launches Big Data Service

Extending its lead in the Network File Service (NFS) client/server marketplace, Silicon Graphics has announced Big Data Service, an extension to the NFS protocol, which enables the movement of large sequential files across a network 10 to 20 times faster than NFS on today's HIPPI connections.

Independent of the Big Data Service technology, the company has also announced the new world record SPEC SFS (ILADDIS) results displaying the greatest throughput and fastest response time across a wide range of load points.

Specifically targeted at data intensive markets where high-speed data transfers are critical for the efficient use of expensive resources, Big Data Service offers customers the ability to transfer large amounts of data quickly—up to four HIPPI channels at 50 MB/second per channel, delivering an aggregate data transfer rate of up to 200 MB/second. Customers in research, supercomputing, animation, oil and gas, GIS, and prepress can take advantage of this powerful new software technology to expedite access to critical data and dramatically increase productivity.

"Our customers in technical, commercial, and entertainment markets are experiencing an explosion in the magnitude of data they need to deal with on a daily basis. While NFS provides general purpose file accesses, Big Data Service enables the movement of 100 MB animation files, seismic data, or media files in a fast time frame," said Ashok Desai, MD (SAARC region), Silicon Graphics Systems. "Big Data Service transparently boosts performance and allows people to exploit the higher speed networking technology that is now available."

Big Data Service provides optimum performance by extending NFS with separate high-speed pipes for control and read/write operations which are not limited to a fixed block size. This high-speed networking performance takes advantage of Silicon Graphics' advanced file system, XFS, which is capable of delivering more than 400 MB/second of sustained throughput.

Big Data Service was first publicly demonstrated at Supercomputing '95, where four synchronized, parallel data streams were used to drive four frame buffers, which were then combined into a single large screen with four projectors.

Big Data Service will be available in the third quarter of 1996. To ensure widespread and open use of the protocol, Silicon Graphics intends to license source code. Big Data Service pricing will be $ 6,250 for Silicon Graphics multiprocessor systems, and $ 1,250 for Silicon Graphics workstations.

Dartmail Bags Syndicate Bank Order

Dartmail, a fully X.400 compatible E-mail network with 32 nodes spread all over the country, has recently bagged a networking order from Syndicate Bank, one of India's largest nationalized banks.

The bank's branches will be connected through the Dartmail network before the end of 1996. At present, Syndicate Bank has placed an order for 50 mailboxes to be installed in the first stage.

W.S. Sharaf, executive director, Reserve Bank of India, officially inaugurated the network at the bank's head office at Manipal in the presence of Dr Thingalaya, CMD, Syndicate Bank.

According to Sharaf, "This facility will be useful for transfer of funds, payment advises, and of course, replication of fax and telex messages transmitted through STD. This in turn will facilitate quicker decision-making and better customer service."

The Dartmail network is increasingly being used by banks including Vijaya Bank and Bank of Rajasthan.

Dartmail is the country's largest E-mail network. Launched in September 1995 by Dataline and Research Technologies (I), the service is based on HP's Open Mail technology, and can connect to all the major X.400-based networks via VSNL's GEMS 400. The system connects into the Internet, providing access to 40 million e-mail addresses worldwide. The system has the capability to send color images, graphs, charts, pictures, sound, and text.

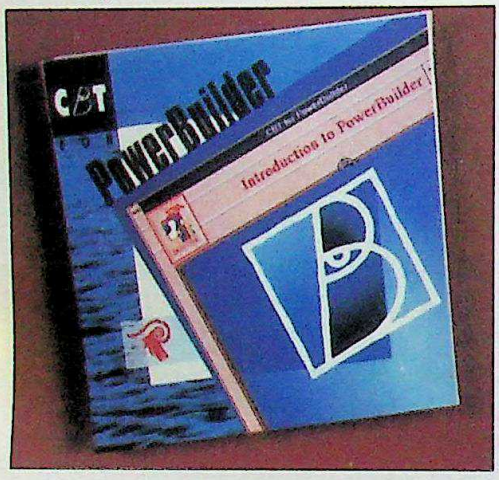
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INDIAN SECTION
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Indian CBT Retailed in US Market

Boston Management Consultants, Bombay, has announced that ViaGrafix, a leading distributor of training courses for PC and Macintosh based software in Pyron, Oklahoma, USA, has bought its PowerBuilder CBT (computer-based training) package. The package, developed in India by Boston, will be marketed and retailed under the ViaGrafix label.

PowerBuilder software is a portable, database-independent rapid application development and deployment tool. It is



used by major organizations around the world for quick development of client-server applications.

According to Dr Arvind Shah, chairman, Boston Management, "We decided to develop the PowerBuilder CBT so that people can learn on their own and also learn the software before actually buying it. We also knew that we had to make a product of world standards and look at the world as a market."

Boston's PowerBuilder CBT underwent several layers of testing, but not a single change was asked for by ViaGrafix. This product is being distributed in retail markets in the US through various stores. It is also being displayed in various trade shows in the US and Europe like CeBiT, Germany.

Multimedia Inkjet Printer Range from Wipro

Wipro Peripherals, India's leading printer company, has announced the Wipro Genius Writer brand of inkjet printers. The range, currently having four printers



covering the portable and desktop segments in monochrome and color, is expected to widen in the coming months with fresh launches. This marks the entry of a new brand in the fast growing inkjet market, estimated to be around 100,000 units in 1996-97. Inkjets are expected to be the largest segment of the printer market in the coming years, with a high focus on color printing.

These printers are manufactured in Japan by Canon Inc. Wipro is an OEM to Canon currently. Over the next 12 months, some of these models are expected to be manufactured in India by Wipro. Canon is a respected global corporation with revenues of US $ 19 billion in financial year 1994. The company holds the largest number of patents (1096 US patents in fiscal year 1994), and has leadership positions in bubble-jet printers, laser printer engines, copiers, cameras, business machines, and so on.

The models available immediately are IJ40, IJC80, IJC310 and IJC5100. While the IJ40 is a monochrome portable injket, the IJC80, IJC310 and IJC5100 are color models covering the portable and desktop segments. The models are capable of a maximum resolution of 720 dpi in the monochrome mode. Both the IJ40 and the IJC80 are the world's lightest injket printers weighing 1.4 kgs only.

A unique feature of the Wipro Genius Writer models is the wide range of print media they can handle. In addition to conventional plain paper, transparencies, coated and glossy sheets, these printers can also print on back print films for translites, T-shirt transfer paper, and fabric sheets. This makes the printers ideal for several new applications in the office, home and professional segments, in addition to conventional ones like business correspondence, presentation transparencies, color proposals, and so on. All the printers are aesthetically designed with small footprints. They are available with a standard three-year warranty. A unit swap scheme for the first year is available, where a user can exchange printer for a good one within the first ye of operation at any Wipro outlet.

Wipro Peripherals is an independ division of the Wipro Infotech Gro which is a part of Wipro Corporat Wipro's IT businesses include comput peripherals, software projects and s tions, communication systems, and tem integration.

Wipro Infotech recorded a turnove Rs 5.421 billion in 1994-95.

Madge Brings ATM to the Forefront

Amsterdam-based Madge Networks announced the availability of the dustry's first fully-switched famil standards-based backbone and acc products for integrating Asynchron Transfer Mode (ATM) into mainstr business networks. These products ext the Madge Collage family and deliver next phase of the Madge Switching to ATM roadmap announced last Sept ber.

For the backbone, Madge will de the Collage 740 Backbone ATM switc next generation, high-performance Mbps switch supporting LANE for t Ethernet and Token Ring networks. direct access to the ATM backbone fr LAN segment, Madge is delivering Collage 530 Ethernet-ATM Access sw the Collage 540 Token Ring-ATM Ac switch and the LANswitch LSA Ac switch, a module for the award-win LANswitch family of switching h Madge already delivers a complete Mbps ATM workgroup solution that be integrated with the Collage 740, all ing end-to-end ATM networking.

Robert Madge, chairman and CE Madge Networks says, "The availab of these ATM switches represents the step in our commitment to deliver bes breed, end-to-end switched solution outlined in our `Switching to A roadmap. Madge Networks is combi its technology strength in local area works with its understanding of custo needs to deliver ATM solutions."

Madge Networks is a leading supp of switched networking solutions for dium and large enterprises using m media applications. The company is resented in India by Godrej.

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INDIAN SECTION
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NIIT and Powersoft to Launch New Client/Server Products

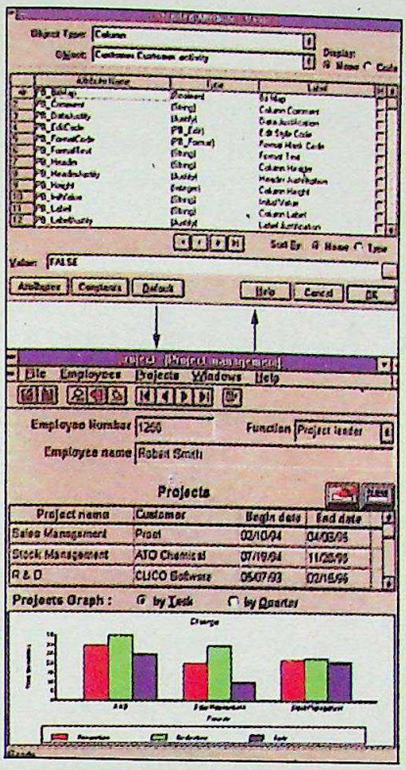
New Delhi-based NIIT and Powersoft Corporation of the US have announced that they will soon launch new upgrades and add new product lines to the Powersoft client/server range in the Indian market. Primary among the new upgrades is the latest release of the leading application development tool PowerBuilder 5.0 and Database Modeling tool S-Designor 5.0.

In addition, NIIT and Powersoft will add a new product line with Optima ++, a Rapid Application Development (RAD) tool to deliver client/server and Internet applications. Optima ++ will address the increasing demand for high-performance, component-based application development tools, and will enable developers to create powerful and efficient C++ applications quickly and easily. A significant addition to the Powersoft product family, Optima ++ leverages proven and successful technology from PowerBuilder, Watcom C/C++, and Sybase SQL Anywhere.

It is based on Watcom C/C++ compiler technology and it delivers native machine code 32-bit executables. Optima ++ will meet the needs for client/server development by supporting both data-aware bound controls and PowerBuilder DataWindow to provide sophisticated data access, presentation, and analysis capabilities. Optima ++ also comes bundled with the compact, high-performance Sybase SQL Anywhere database.

NIIT will offer Optima ++ in a number of user editions, with the first edition expected to ship within 60 days.

NIIT and Powersoft will soon introduce PowerBuilder 5.0, the next generation release of the leading client/server application development tool. Scheduled to ship in the first half of 1996, PowerBuilder 5.0 enables the deployment of fast applications anywhere and in all areas of the enterprise. Available for Windows 3.1, Windows 95, and Windows NT environments, PowerBuilder 5.0 boasts of next generation client/server features like machine compiled 32-bit code for hi-performance script execution, practical application partitioning of PowerBuilder objects for improved application performance and management, full 32-bit Windows 95 logo-compliant development environment, and extended OLE 2.0 support. PowerBuilder 5.0 will also include Object Cycle, a powerful server-based object management facility to assist team development in workgroup setting.



S-Designor for PowerBuilder follows a bi-level approach to separate logical and physical levels.

NIIT and Powersoft shall also introduce S-Designor 5.0 toolset of client/server modeling tools. The S-Designor toolset enables client/server professionals to analyze business processes and model databases for superior application development. It includes four separate integrated modules that address the needs of the various members of a development team, from the database designer to application developer to the database administrator. The four modules include: S-Designor 5.0 Data Architect for database design and construction; S-Designor 5.0 Process Analyst for process analysis, S-Designor 5.0 AppModeler for application generation; and S-Designor 5.0 Meta Works for advanced multi-user dictionary capabilities.

"NIIT Ltd, the principal distributor of Powersoft products in India, has drawn up elaborate plans to make the new Powersoft offerings available in the country through its network of offices and support centers. With emphasis put on support, we have already built skilled expertise to effectively bring the benefits of Powersoft's next generation products to organizations in India." says O.R.S. Rao, senior vice president, NIIT. "These next generation client/server applications from Powersoft will equip Indian organizations to meet the growing demand for robust, high-performance applications within aggressive deadlines."

Powersoft Corporation is a wholly-owned subsidiary of Sybase, a US-based leader in client/server software.

PRT to Set Up Software Facility

US-based Platform Reengineering Technologies (PRT) Corporation, a US $ 20 million company specializing in IT consulting, has decided to set up a software development center in India. The facility, expected to become fully operational by the end of the current year, will include a fully integrated R&D center, and will involve an expenditure of US $ 250,000. The facility, registered as PRT India, will come up in the software technology park in Pune.

PRT Corporation recently set up a subsidiary in Barbados. The parent company will book orders and sub-contract the work to PRT India and the sister concern in Barbados.

The Pune facility is being designed as a one-stop window for servicing and providing software solutions to PRT clients in the Asian region. It will also serve as an in-house training center for software professionals.

Intecos Aligns with SQA

Intecos, the promoter of Quality Assuarance Institute (India), has set up Intecos-Set (India), a new company that will distribute, promote, and market software engineering tools in the country. The products will focus on automation of the software development process in areas like analysis, design, project management, risk management, process management, estimation, reengineering, metrics, quality management, CASE, and configuration management.

Intecos-Set will also develop tools, provide consultancy, and train professionals. The new company has tied up with SQA of the US for the distribution and marketing of client/server testing tools

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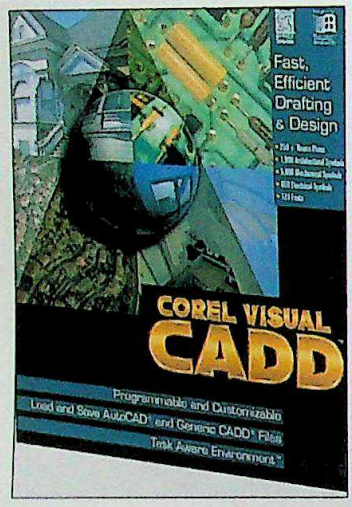
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TIE-UPS

Corel and Numera Launch Visual CADD

Corel Corporation and Numera Software have teamed up to promote Visual CADD, a professional design and drafting software for new and experienced CAD (computer-aided design) users.

Corel Visual CADD will sell through Corel's diverse sales channels, and Numera will continue to sell Corel Visual CADD and support independent software vendors directly from their headquarters in Seattle, Washington. As part of the



agreement with Corel, Numera Software will also continue to develop Visual CADD.

"Corel Visual CADD is a lightning-fast drafting tool that will not only complement Corel's graphics products, but will finally give AutoCAD customers a true alternative for design and drafting," said Dr Michael Cowpland, president and CEO, Corel Corporation. "The broad set of drafting tools and extensive symbol, font, and house plan libraries give you the best product for the money, while the advanced file compatibility with AutoCAD and Generic CADD provides the only tool that you can use without concern for the "AutoCAD" requirement."

"With Corel leading the charge, current AutoCAD LT users can finally break the AutoCAD bondage," said Kevin Cable, president and CEO, Numera Software. "Our technology and Corel's distribution will get the right product at the right price in the marketplace."

Corel Visual CADD is a native Windows 95 and Windows NT application, taking full advantage of those operating systems' performance enhancements. It also supports OLE 2.0 and multiple document interface. It includes full read and write capability for Generic CADD .ged files and AutoCAD .dwg and .dxf files, integrating AutoCAD external references and paper space. There are also many advanced drafting productivity features in Corel Visual CADD including multiple view ports with Bird's-Eye View, Dynamic Reference Frames, 2-D Boolean, and matching/tracking. The product is fully customizable. Its open architecture makes it easy for architects, mechanical engineers, civil engineers, and other professionals to create custom applications using any standard Windows programming language such as Visual Basic, C++, or Delphi. The internal scripting capabilities give users the ability to perform even the most tedious of repetitive tasks with the press of a single key. Its modern code base is capable of supporting a wide variety of applications without compromising speed or usability.

Novell Licenses Open Market Technology

US-based Novell has announced that it has licensed Open Market technology to enable a new generation of electronic commerce solutions for intranets and the Internet. Novell will integrate Open Market's OM-SecureLink technology with NetWare to provide customers with a cost-effective solution for establishing and maintaining online storefronts, and for managing electronic transactions on the World-Wide Web. These commercial services will complement the complete foundation of network services provided by Novell to enable a Smart Global Network interconnecting today's private business networks and the Internet.

Novell will use OM-SecureLink technology to enable customers to connect their Web server to Open Market's OM-Transact, the transaction managing system for secure Internet commerce. These back-office services can be hosted by either a third-party provider or internally on the corporate intranet. Open Market technology utilizes digital encryption technology to securely transmit 'digital offers' from a customer's server to the back-office service provider. To ensure the integrity of the transactions, OM-Transact checks each digital offer using a secret key it shares with the customer.

"Together with Open Market, Nov is developing solutions to provide an i portant step in delivering secure financ transactions", said Robert J. Frankenbe Novell chairman and CEO.

"The installed base of 3 milli NetWare servers, and the power NetWare Directory Services to secure manage customer networks, will m online storefronts and electronic trans tion management an integral part of h people do business."

"Partnering with a leading netwo ing company like Novell is an import piece of our business strategy to m electronic commerce easy and rea available for companies who want to co duct business on the World-Wide We said Gary Eichorn, CEO of Open Mark "By incorporating our technology w Novell's NetWare Web Server line, we created a powerful combined solution promoting Internet commerce."

NetWare is an optimal platform electronic commerce due to the secu managed, high-performance environm created by NetWare Directory Ser (NDS). The integration of OM-SecureL with NDS will allow IS managers a s stantial level of control over electr commerce security issues by ensuring transactions are authorized correctly addition, Novell customers will be ab outsource some of the complexity and of hosting the transaction manage system by subscribing to NetWare C nect Services (NCS).

The Novell and Open Market s tions will enable customers to sup secure transactions while protecting isting investments in hardware and s ware. The solutions will improve flow for the customer, as electronic t actions can be processed and reso faster than with all-paper mechani and will enable cost reductions thr outsourcing of the billing process. nesses will also benefit from impr inventory management and processi orders, an expanded ability to do bus worldwide 24-hours per day, and acc new customers and markets throug Web. Novell plans to ship the Open ket technology as an integrated Web er product in late 1996.

Novell operates in India thr Bombay-based Onward Novell Soft India, which is a 50:50 joint ventur tween Novell and Onward Technol which specializes in power devices

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HCL-GI Joint Venture

New Delhi-based HCL Corporation has signed a joint venture agreement with General Instrument Corporation (GI) of the US. The new venture, in which both companies will be equal partners, will design, manufacture, and distribute broadband communications equipment for India and the SAARC region.

The products that will be available as a result of this joint venture include set top terminals, line amplifiers, SRF and fiber optic distribution equipment, and headend electronics. The range will enable the delivery of a larger number of channels (50 to 100) on existing TV sets. With upgrades, which will be made available locally by the joint venture company, the equipment will also facilitate future services such as pay TV, pay per view, home shopping, education on demand, video conferencing, and high-end graphics communication.



Shiv Nader, chairman, HC, and Richard S. Friedland, chairman and CEO, GI, exchanging documents after signing the agreement.

Signing the joint venture agreement, Shiv Nadar, chairman, HCL Corporation, said, "The joint venture is a logical extension of HCL's strategic plan to address the entire spectrum of information technology and communications businesses. In the process, this will help India to be on the information highway."

As part of the joint venture, a design center and a manufacturing facility will be set up in India. The newly formed company will have continued access to the latest technologies available with GI worldwide. "HCL has a track record of integrating the latest technologies and turning them into benefit propositions for mass markets. This joint venture will keep our markets abreast of world standards as they evolve," added Nadar.

Richard S. Friedland, chairman and CEO, GI, said, "India is of strategic importance in GI's initiatives to deploy industry-leading video, voice and data technologies in emerging international markets. HCL's experience in manufacturing high-technology products and its established distribution network complement GI's premier position in broadband communications equipment around the world. The combination of GI and HCL will result in an immediate and significant market presence."

The US $ 2.4 million General Instrument Corporation is a world leader in developing technologies, systems, and product solutions for the interactive delivery of video, voice and data.

HCL Corporation is a $ 450 million transnational group with interests in computers, networking, office automation equipment, medical electronics, computer education, and software services.

With the rapid growth of cable television networks in the country, and the virtual explosion in the TV industry, the joint venture between HCL and GI appears to have a very bright future.

Philips, DoE Set Up EMT Training Center

The New-Delhi-based Standardization, Testing and Quality Certification Directorate (STQC) under The Department of Electronics, Government of India, has tied up with Philips to set up a training center for electronics manufacturing technology (EMT). While Philips has contributed Rs 6.7 million towards SMT flowline, along with a commitment of Rs 1 million per annum for 3 years, towards spares, consumables, and training, STQC has provided space, infrastructure, and equipment worth Rs 12.5 million. The institute will be run by STQC staff.

The Philips-STQC EMT institute, the first of its kind in India, is backed by the technological expertise of the Regional Electronics Regional Test Laboratory (North). It will offer complete solutions under one roof to all problems in the area of SMT.

The institute plans to conduct the existing training programmes in EMT. Two new programmes will also be introduced on SMT for product engineers, and SMT for process engineers. Besides training, the institute will also undertake consultancy in quality improvement.

Apcom is Cabletron Distributor

Madras-based Apcom Computers, a provider of leading networking solutions to the Indian market, has been appointed by Cabletron Systems of the UK as distributor of its complete product range in India. Apcom will distribute Cabletron products through its channel partners.

Says Alan McMillan, MD (Asia-Pacific), Cabletron Systems, "This agreement teams two of the leading providers of networking solutions in India and through this agreement, Cabletron has secured another strong and reliable distribution channel for its products."



Alan McMillan (left) of Cabletron and Ashok Mirza of Apcom at the tie-up ceremony.

Ashok Mirza, director, Apcom Computers, added, "Cabletron and Apcom reached this agreement based on the market opportunity created by India's rapidly expanding LAN market. Our relationship with Cabletron allows us to meet the needs of the growing market demand for Cabletron products in India."

Under the terms of the agreement, Apcom will provide the complete range of Cabletron's networking hardware and software to its Indian customers.

FACT for Professionals

Delhi-based IIS Infotech and Vedika Software of Calcutta are jointly offering a certified course for finance and accounting professionals. Students opting for the course will be trained on FACT, Vedika Software's popular financial accounting package. IIS will offer ALC (authorized learning center) certification to IT education companies and provide courseware and training. The courseware, created by experts from IIS Infotech and Vedika Software, conforms to ISO 9001 standard.

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IN BRIEF

Frontier Technologies Offers Free Client Software

Frontier Technologies has announced that, for a limited time, it will offer Internet users a freely downloadable trial version of its SuperWeb Server client including WebDesigner, to create World-Wide Web homepages and to explore Intranet implementations. Frontier Technologies will recognize the "Top Ten Unhomeless People" based upon the best ten Intranets or homepages submitted every week.

Those interested in creating a homepage without the requirement of HTML expertise, may go to *http://www.frontiertech.com* to download the free tools, and to access a step-by-step tutorial to aid them in using Frontier Technologies' WebDesigner, which works like a wordprocessor to create Web pages for Internet or Intranet networks.

Frontier Technologies' SuperWeb Server is an all-inclusive Windows NT-based Internet/intranet server which provides remote administration, built-in HTML and image map editors, and Web page access in 14 different languages. SuperWeb Server's WebDesigner authoring tool allows even non-technical users to create and maintain their own Web pages. With remote administration, Web pages may be accessed and updated from any location. The free demo of SuperWeb Server will expire in thirty days. SuperWeb Server is priced at $ 795.

HP Cuts NetServer and Disk Drive Prices

US-based Hewlett-Packard Company has announced aggressive price cuts across its entire HP NetServer series and family of disk drives.

These price cuts are part of HP's strategy to lead the marketplace in affordable, high-performance network servers. The latest announcement lowers the price of HP's entire NetServer Series by up to 21 per cent, and disk drives by up to 15 per cent. HP made the price cuts to pass on industrywide price reductions to customers, and to continue HP's competitive advantage. "These price cuts clearly make the HP NetServer Series the leader in price/performance," says Duncan Campbell, worldwide marketing manager for HP's Network Server Division.

The HP NetServer Series offers a wide range of aggressively priced servers from single processor, Pentium 75MHz processors to affordable high-performance quad-processor Pentium/133 models. HP combines these processors with PCI buses, fast and fast/wide SCSI-2 controllers, and high-speed disks to create high-performance systems.

The high-end HP NetServer 5/133 LS features dual processors, 64 MB RAM and 1 MB of cache per processor. It has been reduced in price by 21 per cent, from a street price of $ 16,091 to $ 12,778.

NetServer 5/100 LH and 5/133 LH feature 32 MB ECC memory and 256 KB of write-back cache. These have been reduced in price by 12 per cent, from $ 6,830 to $ 6,011 and $ 6,902 to $ 6,074, respectively.

In the accessory category, HP reduced the price on the following by 15 per cent: 1 GB Fast SCSI-2, from $ 557 to $ 476; 1 GB hot-swap drives from $ 620 to $ 530; and 4 GB disk drives, from $ 1,466 to $ 1,250.

Workshops on Intra Aortic Balloon Pump

The Healthcare Instrumentation division of Bangalore-based Advanced Micronic Devices (AMDL) recently organized a workshop series on IABP (Intra Aortic Balloon Pump) in Calcutta, Bombay, New Delhi, Bangalore, and Coimbatore as part of the company's ongoing clinical education program. Gordon Dewhurst, a clinical specialist with DataScope, USA, conducted the workshops, outlining how to get the best clinical benefit out of IABP. IABP is one of the most widely used circulatory assist devices that support a failing left ventricle, and AMDL is the leading vendor in this arena, having supplied over 90 balloon pumps to all the leading cardiology centers in the country.

"Recent breakthoughs in design have enabled doctors to insert the Intra Aortic Balloon easily at the bedside, permitting a wide range of hospitals to take advantage of this potentially life-saving treatment modality" said S.N. Kumar, director, AMDL, adding, "Our intention in organizing this workshop is to help be... usage of this life saving device."

AMDL is one of India's leading "tec... nology-driven companies specializing ... healthcare instrumentation, healthc... consumables, information technolo... (hardware and software), and comm... cation and scientific systems.

Nashpack for Windows 9...

Bangalore-based Nashsoft System... software company specializing in a... virus solutions, has launched Nashp... for Windows 95, an anti-virus package ... Windows 95. Nashot for Windows 95 ... been well received in Singapore, and ... now being marketed in India along w... invaluable system maintenance tools p... aged as NashPack for Windows 95. T... same will also be marketed abroad.

Nashpack, which has already s... success in the Indian market, has b... developed for the Windows 95 platfo...

The Windows 95 tools address h... disk and common computer proble... There are anti-virus tools like Nashot, ... managers like Data Organizer, crisis ... like Unformat and Undelete, and ut... tools like DiskCopy and System Infor... tion. The concept of Nashpack is to p... vide to the user an entire range of t... which make working on the desktop a ... filled experience.

Macromedia Strikes Deal with Informix

Informix Software and Macrom... have signed a marketing and deve... ment pact, enabling users to store ... created with Macromedia's Direct... multimedia development tool in Infor... databases.

Informix already supports Hyp... Markup Language (HTML) and li... graphics formats in its OnLine Dyn... Server database, but this will extend ... port to more sophisticated media ob... such as Java applets, Director files, ... Quick Time movies, giving World-W... Web developers a better infrastructu... Web site management.

Earlier this year, Informix acq... Illustra Information Technologies ... unveiled its plans to ship by the year's ... Informix Universal Server, which m... both companies' databases. Informi... a base for R&D in Bombay.

Wipro Sy...

Bangalore-ba... a part of Wipro ... ed the Golde... Quality Award ... for the yea... World Congre... held in New ... award is in re... Systems' com... which is based ... tion of ISO 90... standards. The ... at Wipro Sys... well-defined qu... reliable process ... and is highly ... Wipro's quali... encompasses ... ity, including r... ture, and servi... processes are ... nature and its ... organization st... ured most to ... company.

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AWARDS/APPOINTMENTS

Wipro Systems

Bangalore-based Wipro Systems, a part of Wipro Infotech, was awarded the Golden Peacock National Quality Award in the services sector for the year 1995, at the sixth World Congress on Total Quality held in New Delhi recently. The award is in recognition of Wipro Systems' commitment to quality, which is based on a strong foundation of ISO 9001 and other world standards. The quality movement at Wipro Systems is driven by well-defined quality life cycles with reliable processes and procedures, and is highly customer-oriented. Wipro's quality consciousness encompasses all its areas of activity, including research, manufacture, and service. Wipro Systems' processes are comprehensive in nature and its customer-oriented organization structure has contributed most to it being a 'quality' company.

Wipro has a strong base in strategic quality planning, human resource management, organizational leadership, competitive benchmarking, and product and service quality assurance and customer satisfaction.

The award is instituted by the Institute of Directors—an apex association of corporate directors committed to improving the competitiveness of the Indian industry through total quality strategies.

Frontier Technologies

Frontier Technologies' SuperTCP Suite product line has won *PC Week*'s first annual Corporate Information Technology Excellence award in the TCP/IP category. The award was revealed in the April 1 issue of PC Week's 'Reviews' section, and on-line, at *www pcweek.com/reviews/itx.html*.

After evaluating over 1,000 products, *PC Week* Labs distributed awards in more than 50 categories including enterprise networking, client/server computing, Internet/intranet products, business productivity, and desktop and mobile computing. One product in each category was selected to receive the ITX award based on the ability to solve complex business problems in large corporations.

SuperTCP Suite 96 is an integrated solution that turns PCs into full members of the corporate network utilizing the TCP/IP multiplatform communications protocol. SuperTCP Suite 96 includes over 40 applications which provide network communications, including the Network File System (NFS), Internet information management, mainframe and minicomputer host access, an X-Windows server, and comprehensive network administration. SuperTCP Suite 96 applications run on all three Windows platforms—3.x, 95 and NT.

Informix

US-based Informix Software, a leader in parallel processing database technology, has announced a record-breaking TPC-C benchmark result on Digital Equipment Corporation's 64-bit AlphaServer 8400 5/350 system, beating Oracle's existing performance record on the same platform. In a similarly configured system comparison against Oracle, Informix exceeded Oracle's version 7 transaction throughput by 19%. Informix also performed better than Sybase's System 11 benchmark on the AlphaServer 8400 5/300 by over 23%.

Informix OnLine Dynamic Server version 7.2 delivered 13,646 tpmC at an outstanding price/performance level of $ 277/tpmC, running the Digital AlphaServer Model 8400 5/300. By contrast, Oracle achieved only 11,456 tpmC, on a more expensive hardware configuration.

The benchmark quantifies the combined power of Informix's parallel processing database architecture with the 64-bit large memory addressability in the Digital Alpha VLM64 architecture. Optimized together, both products deliver record performance capabilities for customers with requirements for business-critical applications such as OLTP and data warehousing.

Silicon Graphics Systems

The Indigo2 IMPACT workstation family from Silicon Graphics has been named 'Product of the Year' by the CyberEdge Journal. One of the 41 finalists, Indigo2 IMPACT was chosen by a panel of 40 judges comprising editors and technology experts from the virtual reality community.

Selected for pushing the boundaries of price and performance by bringing high-end technology down to a more affordable level, Silicon Graphics received its award on April 1 at an IEEE Virtual Reality Annual International Symposium (VRAIS) ceremony in Santa Clara, USA. The award is granted each year to products in four categories that significantly advance the latest in virtual reality.

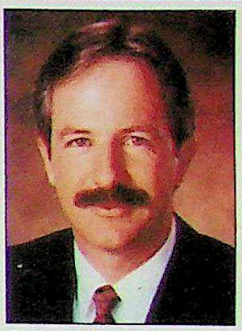
"Every year there are a few virtual reality products and applications that really excite me", said Ben Delaney, editor of CyberEdge Journal." These are the realized ideas, the dreams-come-true that take me back to the first demo of virtual reality I ever saw. Silicon Graphics has once again raised the ante in the performance poker game".

The Indigo2 IMPACT family provides users with real-time image mapping and high-speed volume rendering. It is the only graphics platform to offer both the world's fastest 3D graphics and image performance on a desktop. Performance levels attained an even higher level with the January 22 introduction of the Indigo2 IMPACT 10000 systems.

An extension of the original family, Indigo IMPACT 10000 combines the computational power of the MIPS R10000 RISC microprocessor with the interactivity and realism of Indigo2 IMPACT graphics, all in a complete 64-bit software environment, IRIX 6.2. The family includes three primary models, Indigo2 Solid IMPACT 10000, Indigo2 High IMPACT 10000, and Indigo2 Maximum IMPACT 10000.

UB Networks

Peter Ciceri has been appointed VP and GM (Asia-Pacific operations) at UB Networks. He will be responsible for the overall business and sales activities of the company, including direct channel sales, strategic accounts development, marketing, services, and support in the Asia-Pacific region. Before this appointment, Ciceri was



Peter Ciceri.

associated with HP's Asia Pacific branch as GM (reseller sales and marketing).

Ciceri will report to Chris Brenann, COO, UB Networks. His priorities will be 'building a strong presence in the channels, services, and key accounts'.

Ciceri boasts over 10 years of direct and indirect computer industry-related sales experience in the Asia Pacific region. He has worked at Unisys in Asia and Canada. He will be based at UB Network's new Asia Pacific headquarters in Hong Kong.

Wipro BT

Simon Orme has joined Wipro BT, Bangalore, as deputy chief executive and head of operations from BT Global Satellite Services, UK. Orme's responsibilities will include day-to-day operations, and management of the messaging system, VANS, VSAT networks, and the billing system. As head of operations, he will ensure appropriate technology selection in the enhancement and implementation of services, and to develop strategies on cost-effective technologies.



Simon Orme.

Orme was responsible for the planning and implementation of BT's global expansion programme.

BT Global Satellite Services is a unit of BT Global Marketing. It supports BT's global strategy through the delivery of VSAT-based services.

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CAREER OPPORTUNITIES IN COMPUTING—AND MORE

Q: I am 16 years old and want to be a computer programmer when I grow up. What do you think is the best programming language to learn?

A: Without a doubt, the first programming language to learn is BASIC. It is straightforward, relatively simple and has evolved to support modern elements such as visual interfaces and objects.

Learning BASIC demystifies computing. I recommend it to people of any age who want to get a sense of how computers work—and a grasp of what a computer can and can't do well.

A working knowledge of BASIC is useful even for people who don't expect to become programmers. People who do expect to be programmers, and who have gained thorough familiarity with BASIC, can move on to a harder-core language such as C-plus-plus, or a variant of C-plus-plus such as Java. But BASIC is the right place to start.

Q: I am 14 years old, female and studying Information Systems at school. In four years when I finish my education what are the probable career opportunities in computing given the rapid changes that are taking place?

A: There will be a wealth of opportunities relating to software. For example, supporting all the people who use software will be a huge business and career opportunity.

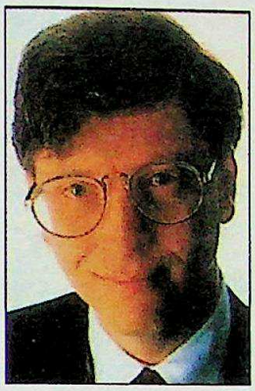
Software companies hire support engineers, and many companies devote personnel to helping their own employees.

Beyond supporting individuals, some people build great careers out of helping companies figure out how to use information systems to the best advantage. These opportunities will only grow.

Fortunately, at age 14 you don't really need to pick one computer-related opportunity over another. I didn't choose a career until I fell into it.

I think it's good to have a fairly fluid view of what you might enjoy doing. Stay open-minded—you might surprise yourself. Is it medical use of computers? Is it computers in museums? Is it business analysis software? There are many ways you can go.

Q: Do you think that PC technical support will eventually become an obsolete field? I envision PCs diagnosing and fixing themselves. Plus, future generations will be more in tune with how a PC works—or doesn't work.



"Learning BASIC demystifies computing. I recommend it to people of any age who want to get a sense of how computers work—and a grasp of what a computer can and can't do well. A working knowledge of BASIC is useful even for people who don't expect to become programmers. People who do expect to be programmers, and who have gained thorough familiarity with BASIC, can move on to a harder-core language such as C-plus-plus, or a variant of C-plus-plus such as Java. But BASIC is the right place to start."

A: Technical support is about as safe a career bet as you can make.

A few decades ago when automobiles started getting much more reliable, someone might have asked, "Are we still going to need auto mechanics?" We do, of course. Similarly, PC tech support will always be important.

Q: I read in a newspaper that in 1981 you said, "640K of memory should be enough for anybody." What did you mean when you said this?

A: I've said some stupid things and some wrong things, but not that. No one involved in computers would ever say that a certain amount of memory is enough for all time.

The need for memory increases as computers get more potent and software gets more powerful. In fact, every couple of years, the amount of memory address space needed to run whatever software is mainstream at the time just about doubles. This is well-known.

When IBM introduced its PC in 1981, many people attacked Microsoft for its role. These critics said that 8-bit computers, which had 64K of address space, would last forever. They said we were wastefully throwing out great 8-bit programming by moving the world toward 16-bit computers.

We at Microsoft disagreed. We knew that even 16-bit computers, which had 610K of available address space, would be adequate for only four or five years. (The IBM PC had 1 megabyte of logical address space. But 384K of this was assigned to special purposes, leaving 640K of memory available. That's where the now-infamous "640K barrier" came from.)

A few years later, Microsoft was a big fan of Intel's 386 microprocessor chip, which gave computers a 32-bit address space. Modern operating systems can now take advantage of that seemingly vast potential memory. But even 32 bits of address space won't prove adequate as time goes on.

Meanwhile, I keep bumping into that silly quotation attributed to me that says 640K of memory is enough. There's never a citation; the quotation just floats like a rumor, repeated again and again.

Q: I just purchased a 28.8 kilobits-per-second modem. Should I start saving the money for a faster modem (when developed)? Or do you think 28.8 is the fastest manufacturers are going to come out with?

A: Probably the fastest conventional telephone dial-up modem you'll ever have is 28.8.

Within a few years you are likely to graduate to an ISDN connection, probably offered by a telephone company, or a cable connection offered by a cable-TV company. These will provide much-greater data speeds than can be achieved through a conventional telephone line.

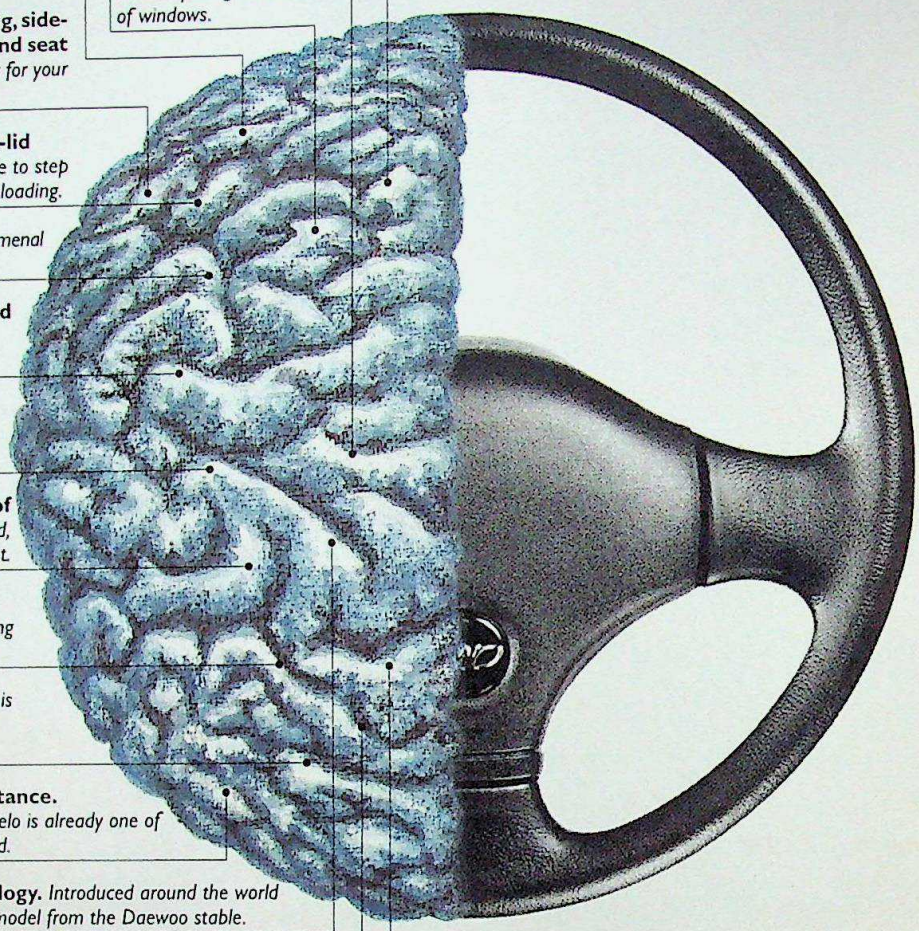
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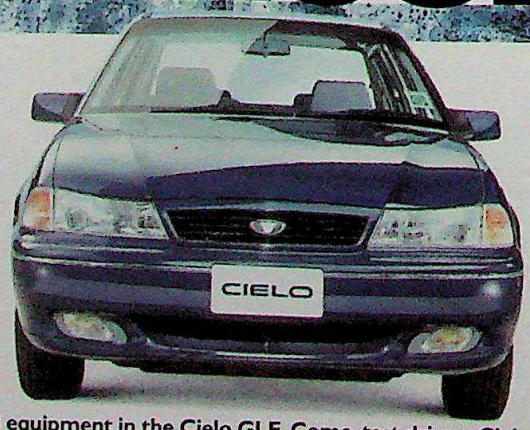
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- **Automatic fuel-flap and trunk-lid opening.** *Just so that you don't have to step out while refuelling and loading or unloading.*
- **530-litre boot space** *means phenomenal appetite for luggage.*
- **Rear-window defroster, front and rear fog lamps** *enhance visibility during winters and monsoons.*
- **Central-locking system** *opens and closes all doors from one single point.*
- **Multi-directional adjustment of driver's seat.** *For forward, backward, upward and downward seat movement.*
- **Deluxe music system and power-antenna.** *For an exhilarating sound experience.*
- **World-class pedigree.** *Daewoo is amongst the top international auto manufacturers today.*
- **International trust and acceptance.** *With over 2,00,000 cars sold, the Cielo is already one of the largest-selling models in the world.*
- **Current international technology.** *Introduced around the world only in 1995, the Cielo is the latest model from the Daewoo stable.*
- **61 dealers across India.** *The best network in the country to take care of service and spares.*
- **The Cielo Helpline.** *Mobile-help service, wherever and whenever you need it.*



Left brain appeal. Right wheel drive.



CIELO

Incidentally, all these features are part of standard equipment in the Cielo GLE. Come, test drive a Cielo today. Like the human brain, it'll make a lot of

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THE INTERNET GOLD RUSH: WHERE'S THE GOLD?

People flocking to the Internet to make a quick buck are quite like the thousands who converged on the gold fields of California in the middle of the last century to make a fortune. Such a gold rush can be disastrous, says Gates.

The Internet Gold Rush is under way. Thousands of people and companies are staking claims. Without a doubt there is lots of gold because the Internet is the beginning of something immensely important.

But I believe that most of the gold is buried very deep, and not necessarily in the spots that people expect.

Gold rushes tend to promote overboard behavior. People get so carried away by the prospect of instant riches that they tend to overbid for easy opportunities and ignore longer term realities.

Few of the thousands of would-be prospectors who converged on the gold fields of California beginning in 1849 made fortunes. In fact the gold rush was either a mortal or financial disaster for many of them. The easy pickings were soon exhausted and massive inflation drove the price of a boiled egg to 75 cents and flour to $35 a barrel.

Many who made fortunes in the boom economy weren't gold prospectors and their success didn't always come right away.

Three years after the gold rush started, a German immigrant named Levi Strauss started a dry goods business catering to prospectors in San Francisco. He made his fortune 20 years later by making and selling riveted denim pants—the first blue jeans.

The rush to reap profits from the Internet and other interactive networks will make more than a few fortunes. Among the winners will be many like Levi Strauss, who find a spin-off opportunity.

The Internet is another case where people who are selling pans to the prospectors often will do better than the prospectors themselves. Analysts, the people who assemble trade shows, consultants, and others providing Internet-related services may have a more sure-fire way of benefiting than the poor prospectors out there wielding picks and axes in the mines.

When you have a major phenomenon, it's often not obvious where the great opportunities lie.

If somebody had foreseen that personal computers were going to be a huge business, the obvious investment would have been in the manufacturers. But the vast majority of the manufacturers failed although if you had happened to pick Compaq or a few others you would have done well.

The less-obvious but more successful strategy would have been to invest in Intel, a maker of microprocessors, and Microsoft, a maker of software. These companies produced vital components of PCs.

> ***In assigning a strategy for profiting from the Internet, people should think of the next 10 years, not the next six or 12 months. They should evaluate what kinds of assets companies are going to build and what income streams can be expected. One obvious opportunity is connecting people to the Internet. Companies that had the foresight to get into the business early have been well-rewarded so far.***

But picking components wasn't a sure-fire success, either. Markets have been extremely volatile. A few years back if you had picked manufacturers of random-access memory chips (RAM), you would have lost your shirt. Yet if you had invested in RAM manufacturing in the past 18 months you would have made a bundle.

In assigning a strategy for profiting from the Internet, people should think of the next 10 years, not the next six or 12 months. They should evaluate what kinds of assets companies are going to build and what income streams can be expected.

One obvious opportunity is connecting people to the Internet. Companies that had the foresight to get into the business early have been well-rewarded so far.

Some of the rewards have been beyond belief. Less than a year ago Microsoft made a $16 million private investment in UUNET, an Internet provider. Today, in the midst of the Internet gold rush, that investment is worth more than $300 million.

The longer-term prospects for new companies providing Internet connectivity are less clear. The market is being invaded by giants—the phone companies, long-distance companies and the cable companies. Around the world, every national telephone company has a plan to get involved in Internet access. It will be very competitive. Opportunities are also plentiful in software that takes advantage of the Internet. This is a bit of a double-edged sword for the giants of the software industry, including Microsoft.

On one hand successful software products—personal-finance products, spreadsheets, operating systems—are becoming obsolete even faster than in the past. If they aren't updated to support interactivity across the Internet, they are likely to be overtaken by competing products that are. That's the risk.

On the other hand there is a spectacular opportunity for software makers to sell Internet-compatible upgrades to existing customers, and to sell software of all kinds to the new customers who enter the PC market because of the Internet. That's the bonanza.

The obvious software opportunity is selling browsers that allow people to view content on the Internet but this is another case where the obvious opportunity is too competitive to be directly profitable. Browsers such as Netscape Navigator and Microsoft Explorer are being given away free because their acceptance has strategic value—and I think they are likely to remain free even as they evolve from today's relatively primitive state into sophisticated products.

As in any gold rush it pays to be wary of hype. In recent months we've entered a period in which many people are willing to believe that cataclysmic things are likely. This has led otherwise-rational people to entertain notions that are a little farfetched.

If somebody had come along even a year ago and said, "We can make a software program 10 times better than anything that's out there," the sober response would have been, "That doesn't sound too likely. Why didn't anyone do it before?"

But today if somebody makes exactly the same claim, but adds "for the Internet," there is an amazing open-mindedness among those who hear the claim. People say, "Really? Software that's 10 times better, and for the Internet? That's great!"

It's the fever of the new gold rush.

Note: The opportunities in Internet connectivity and software may pale beside the opportunities for providing content across the network. That will be the subject of a future essay column.

Questions may be sent to Bill Gates by e-mail. The address is askbill (AT) microsoft.com.

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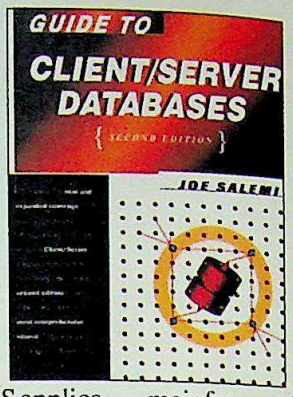
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Guide to Client/Server Databases

By Joe Salemi

Price: Rs 150 Pages: 312

BPB Publications, B-14 Connaught Place, New Delhi 110001.



The rapid evolution of the client/server (C/S) model in the corporate sector has posed a wide range of challenges to network administrators. It is extremely difficult to keep a tab on the latest developments. Moreover, changes are taking place at such a dizzy pace, even experts need regular inputs from authoritative sources.

C/S architecture offers conspicuous advantages. The main advantage of deploying a C/S system in an office is that the processing is divided between the clients in the network, and the database server.

Applications with user interfaces run locally on clients, and are called front-ends, while the main database applications that support a major part of the processing, run on the server and are called back-ends.

The structure and implementation of a C/S system depends on the platforms on which the front-ends and back-ends run, and to a lesser extent, on the distribution of processing between the clients and the server.

The principal advantage of a C/S system is that workstations need run only client software. The division of processing functions between clients and server reduces the load on the network connecting the workstations. Another advantage is that users are not restricted to one system or platform. The same C/S network can accommodate IBM-compatible PCs, Macs, Unix workstations, and so on, and run multiple operating systems such as DOS, Windows, and OS/2. The clients need not use the same DBMS application software. Users can continue to access the database through customized front-ends suiting individual user requirements.

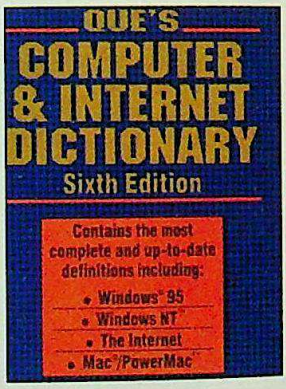
Client/Server Databases by Joe Salemi is an authentic reference book covering practical aspects of setting up, maintaining, and expanding C/S networks in the corporate environment. The second edition contains updated information on the latest developments in C/S market. The author, who is a regular contributor to PC Magazine, discusses C/S databases, PCs, for U workstations, minicomputers for proprie minicomputer systems, and mainframes. There are sep chapters on user front-end development, and mon APIs such as Open base Connectivity (ODB There is a very interesting informative chapter on groupware. A chapter on the ture trends in DBMS techno outlines traditional database tems, C/S systems, objec ented systems, and distri processing systems.

Que's Computer & Internet Dictionary

By Bryan Pfaffenberger with David Wall

Price (Indian reprint): Rs 150 Pages 574

Prentice Hall of India, M-97 Connaught Circus, New Delhi 110001.



Que's Computer & Internet Dictionary is a mine of information on anything even remotely associated information technology. It recommends itself in ways more than one. The sixth edition contains important updates on the Internet and Windows 95. The cryptic information provided against technical terms and acronyms used in common IT parlance is in the nature of comprehensive definitions. The most impressive feature of the dictionary is an elaborate cross-reference system, which urges the reader to look up associated terms for more comprehensive updates. There are over 3,500 entries arranged alphabetically, covering a wide range of IT subjects. Locating a term or an acronym is easy, and in most cases, the definition is adequate. The language is simple, and does not scare away green horns, as most reference books of this genre do.

The listing is quite thorough, as it is difficult to think of technical hardware and software expressions that have been left out.

Que's Computer & Internet Dictionary is probably the only compact dictionary in the market that covers concepts and terminology as ates with W dows 95, Internet, Win NT, the Ma PowerMac uct families what have y

All com and commu tions stand find mention as most pro and jargon used in the fie networking do. A good a fective companion for stu and IT professionals. A m all libraries.

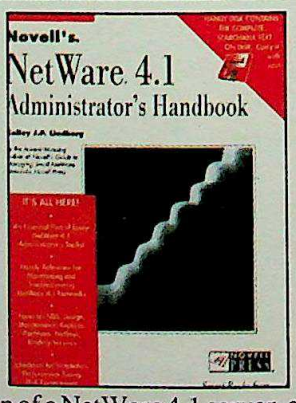
Novell's NetWare 4.1, Administrator's Handbook

By Kelly J.P. Lindberg

Price: Rs 395 Pages: 477

Comdex Computer Publishing, Pustak Mahal

F-2/16, Ansari Road, Daryaganj, New Delhi 110002.



Over the years, NetWare has become the most popular and versatile network operating system (NOS) in the world. Each new version of the NOS contains more features and functionalities, and as its horizons widen, the woes of the network administrator, who must handle a multiplicity of problem areas simultaneously, increase.

Novell's NetWare 4.1, Administrator's Handbook is a handy quick-reference manual detailing basic information on the maintenance of networks based on NetWare 4.1.

The book covers all aspects and major components of NetWare 4.1. The first chapter introduces the reader to common network topologies and cabling architectures supported by the NOS. Chapter 2 covers installation of a NetWare 4.1 server, and upgrading from earlier versions. Chapter 3 discusses ways of managing, maintaining, and monitoring server performance and storage. Chapter 4 deals with the installation and upgrading of network workstations running DOS, Windows, OS/2 and dows NT.

NetWare Directory Se (NDS) is treated in consid detail. Similarly, importa tionality clusters like file agement, network securit managing users and group up a considerable portion book. There is a chapter installation and use of Ne for the Macintosh. Thi (Open Systems Interconne model, the different layers ated with the layers are dis in a chapter entitled Ma Protocols. Extensive tr shooting is covered under ter Planning & Recovery

—*Hirendra C*

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IT SHOWS

Exhibition/Fair	Brief description	Date	Venue	Contact
INFOTECH '96	An exhibition-cum-seminar on computers and telecommunications to discuss the latest trends. New IT products will be on display.	9-12 May '96	World Trade Center Bombay	Trinity Media Ventures A/15 Dolours Colony, Wadala (E) Bombay 400 037 Tel: 4112462/4130382
PC SHOW '96 & SW SHOW '96	An exhibition on PC hardware and software.	20-23 June '96	World Trade Center Singapore	Lines Exposition & Management Services 318B King George's Avenue, Singapore 208563 Tel: 2998611; Fax: 2998633
BUSINESS TO BUSINESS '96	Show on office products and services, including computer hardware and software, and communications.	3-6 July '96 5-8 June '96 & 18-21 Dec. '96 21-24 Aug. '96 17-20 July '96	Bangalore Bombay Ahmedabad Hyderabad	The Assistant Manager—Coordination Conventions & Fair India 157 Princess Street Bombay 400 002 Tel: 2060808; Fax: 2080171
VLDB '96 (Very Large Database Conference)	An international conference on very large database management. Topics include database engineering, data warehousing, implementation techniques, distributed and client/server databases, hypermedia and object-oriented databases, and so on.	3-6 Sept. '96	Bombay	P. Sadanandan NCST, 6th Floor, Major Tower Visvesvaraya Centre Dr Ambedkar Road Bangalore 560 001 Tel: 91(80) 226 3100 Fax: 91(80) 226 1531
CSI '96	An IT show targeting computer users. IT manufacturers and service providers will display their wares. Business opportunities can be explored.	Oct. 30- 3 Nov. '96	Bangalore	M. Dayanand 401, 4th Floor, M.B.C. 134 Infantry Road Bangalore 560 001 Tel: 5511511; Fax: 5562971
COMDEX/FALL '96	A major platform for buyers, sellers, and decision-makers. On display will be the latest in products and services, including computer hardware and software, multimedia, networking solutions, communications, Internet, education and training programs, computer-telephony integration, mobile and wireless computing, and ISDN-related hardware and software.	18-22 Nov. '96	Las Vegas	Business India Exhibitions Wadia Building, 17/19 Dalal Street Bombay 400 001 Tel: 2663449/1425 Fax: 2664364/2041974
T ASIA '96	The number one IT industry show of the country with active participation of IT delegations from the US, Europe, and South East Asia.	6-9 Dec. '96	Pragati Maidan New Delhi	MAIT PHD House, 4th Floor Opp. Asian Village New Delhi 110 016 Tel: 6855487; Fax: 685 1321
OMMUNICATIONS 96	An IT exhibition on communications products and technologies. Good platform for forging commercial and business alliances.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647688 Fax: 4633506/4648692
ROADCAST CABLE SATELLITE DIA '96	A major international exhibition and conference on professional camera, lighting, sound, movie and video production, post-production products, radio and TV broadcasting, and cable and satellite systems.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647688 Fax: 4633506/4648692

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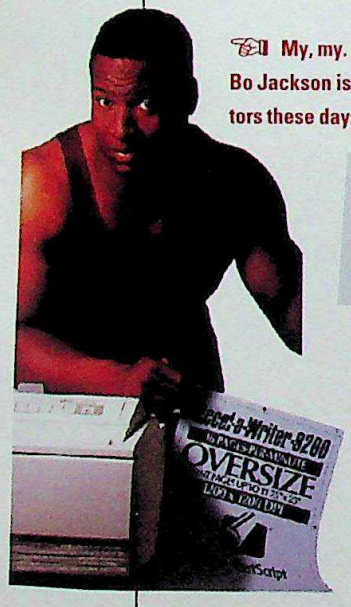
Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

Vive la France

Eight issues ago (December 19, 1995), we asked why a French book about Microsoft Excel was called *Excel: Fingers in the Nose.* Dozens of Francophones rushed to the rescue, and none was more articulate than our Swiss friend Adrian Bruegger, who explained that "fingers in the nose" is the literal translation of the colloquial expression "*les doigts dans le nez*," which is meant to connote "easy," "with little effort," or "with one hand tied behind your back" (or up your nose). *Bien sur. Merci*, Adrian.



My, my. How the Nike has fallen! Bo Jackson is selling printer accelerators these days. (Xante ad.)

Brian Nadel
PC Magazine
One Park Avenue
New York NY 10016

Password: 6YBOD2

Here's one mailing label that could use a good encryption algorithm. (Max Info brochure.)

Laugh in the Face of Death

Writing a will isn't usually a cause for merriment, so we award a gold star for cadaverous comedy to Nolo Press, which is promoting WillMaker 6 with the slogan "Don't Leave Earth Without It."

DIGITAL FUSION™ –ADVANCED COMPOSTING FOR IBM PC's

An alternative to donating your old PC to charity. (4DVision brochure.)

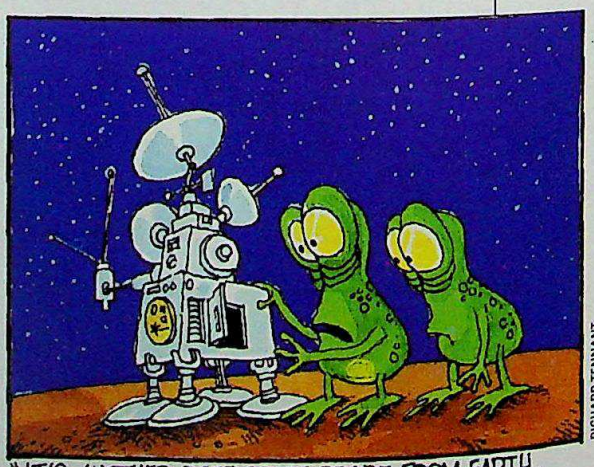


Take one step to the right, lady, and the battery won't be the only thing that's dead! (Power Express catalog.)

Musical Groaners

PC Magazine Labs technical director Larry Seltzer points out a weird humor trend on the Internet: musical instrument jokes. How this started we don't know, but let us know if you've seen any good ones. For example: Why are harps like elderly parents? Both are unforgiving and hard to get in and out of cars.

You'll find more at *http://www.mit.edu:8001/people/jcb/other-instrument-jokes.html.*



"IT'S ANOTHER DEEP SPACE PROBE FROM EARTH, SEEKING CONTACT FROM EXTRATERRESTRIALS. I WISH THEY'D JUST INCLUDE AN E-MAIL ADDRESS."

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EDITORIAL

By Kirtimaya Varma

Damn Piracy, Curse the Pirate, But Pray for His Soul

An important characteristic of the Indian software industry is the hype associated with it. Leave aside the oft-heard boast of the so-called special capabilities of Indians in software development despite the fact that India contributes hardly 0.5% of the global software industry worth $200 billion. The latest hype is the "toughness" of Indian software piracy laws. Nasscom says that Indian copyright laws are the "toughest" in the world.

Let's see these laws in operation. In April last the police raided the shops of two alleged software pirates in Nehru Place in New Delhi. The raids were prompted by Nasscom and Business Software Alliance (BSA). Huge amount of illegally copied software was seized and two persons were arrested. In less than two weeks, both the persons were released on bail! Business has been brisk as usual!



The first raid on an alleged software pirate in India took place way back in 1991 when the police raided his outfit in New Delhi, at the behest of Microsoft and Lotus. The alleged pirate was arrested, but released soon on bail. And he was back in the same business very soon. All through these years, while the law has been taking its own course, the alleged pirate is said to be making hay by selling both legal and illegal software, while the sun of legal delays and complexities shines upon him. On one side, raids on software pirates have been a very remote affair inspite of rampant piracy; on the other, whenever pirates have been caught red-handed and arrested, laws have failed to bind them for long or prevent them from re-entering the unlawful business.

In between this raid of 1991 and the latest raids in April 1996 a lot of water has flowed down the gutter of software piracy. Many cells and associations have come into being with the express purpose of "educating" the masses against the "dangers" of copying software. Nasscom takes pride in saying that it has brought down the level of piracy from as high as 95% five years ago to about 63%. A few months ago BSA had come up with widely varying figure of 85%. It is not our purpose to discuss how fast piracy is coming down. We want to show the hype and hypocrisy surrounding the issue of piracy.

Nasscom, which is spearheading the movement against piracy, would do well to inform us why it has organized its raids only on sellers of pirated software, and never even once on users. It would have been much easier to bring to book users because they can be identified very easily. Besides, law can easily determine whether the software used is legal or pirated. For example, one of the biggest users of software are computer educational institutions and their franchisees. Leading institutions like NIIT, Aptech, Uptron, First Computers, Lakhotia, Priyadarshini, and the host of software companies which have entered the lucrative field of computer education, and so on use hundreds of packages in their branches and franchisees. Are all these packages legally procured? The answer is too obvious to be given. Suffice to say that top executives from many of these institutions are not only members of Nasscom but also its important office bearers. This is not to say that Nasscom is avoiding inconvenient situations for its own members. Indeed, it has already said that the next step in its fight against piracy would be directed against users, though it remains to be seen how far Nasscom will go against its own members in fighting piracy. What is important to note is that inspite of so much hue and cry against software piracy during the last few years, the biggest and the most obvious segment of software copyright flouters has remained unscathed.

I would like to recall an interesting anecdote that brings to focus the hypocrisy. A top office bearer of Nasscom, who is also among the owners of a leading computer training institute, was vehemently criticizing sellers and users of pirated software in a software meet. I privately asked him whether he used legal software in all the branches of his institute. He evasively replied that the cost of legal software was so high in India that one has to carefully explore the business side of using them in situations where a very large number of packages were required.

So we are back to square one—the cost of software is too high for PC users in Third World countries. The president of a New Delhi-based computer company, who prefers anonymity, says that the PC revolution would not have been possible without software piracy. One has to see this view in the light of the fact that during the early days of the PC the hardware was very costly. How many would have chosen to use the PC if they had to pay through their nose for both the hardware and software? A.K. Saxena of eponymous software company asserts without requesting anonymity that piracy has, in general, helped the PC industry to grow. To my mind miniaturization and piracy are the two factors that brought computing to the masses; without them, computing would have hardly come out of its elite shell.

This is not to say that we support piracy. Who can deny that software writers should get the fruits of their labors? However, one fails to understand that even those software which have sold millions of copies, and brought in piles of money for software companies many, many times over the expenditure incurred in making the software, are sold at unaffordable prices. Piracy is a two-edge sword that, on one hand, deprives software writers of their legitimate income but, on the other, helps them earn more by building up a vast base of users. The latter fact not only helps in greater penetration of the product into the market but also in getting better feedback about the product for incorporation into newer versions of the software. No software company would have been able to sell millions of packages had it not been for the vast base of installed PCs, which would not have been possible without piracy.

There's nothing new in these observations. Only, we don't want to admit.□

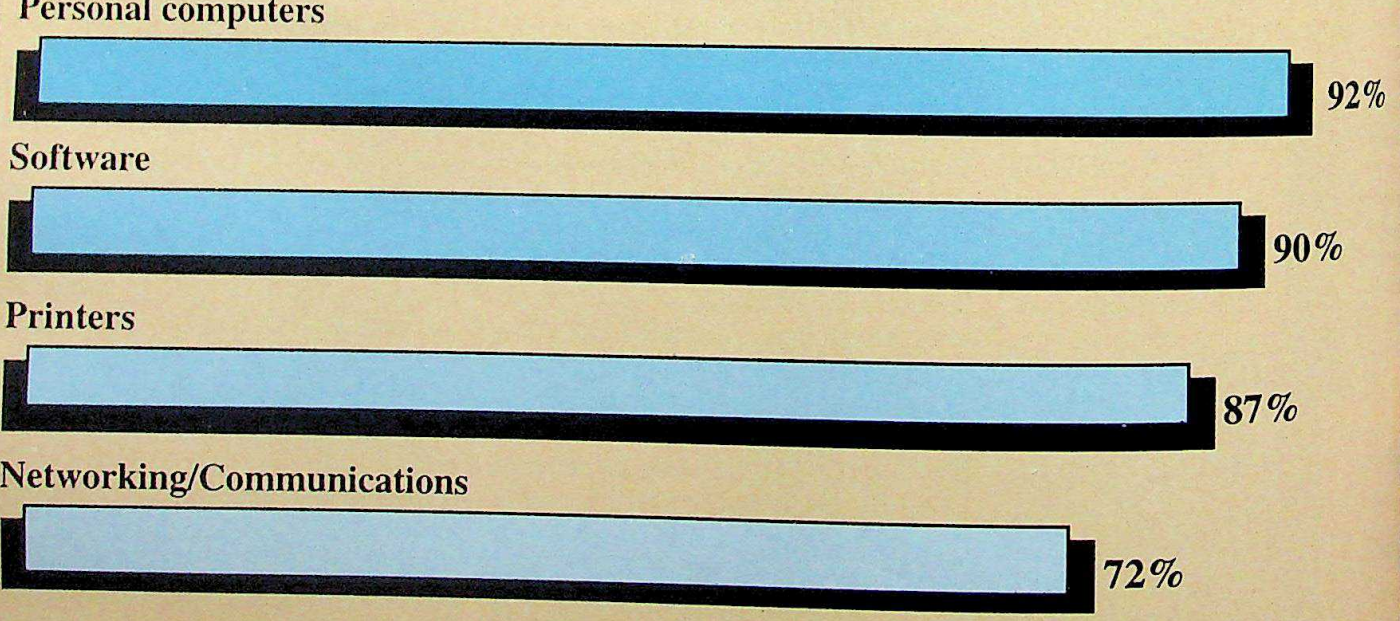
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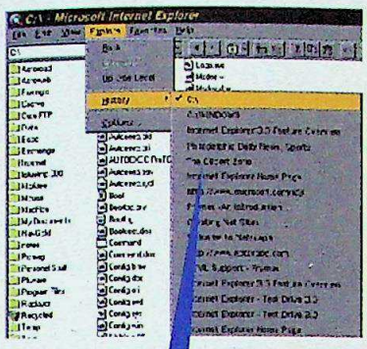
Microsoft Charts Net Course...

ActiveX takes on Java; Internet Explorer heads for AOL.

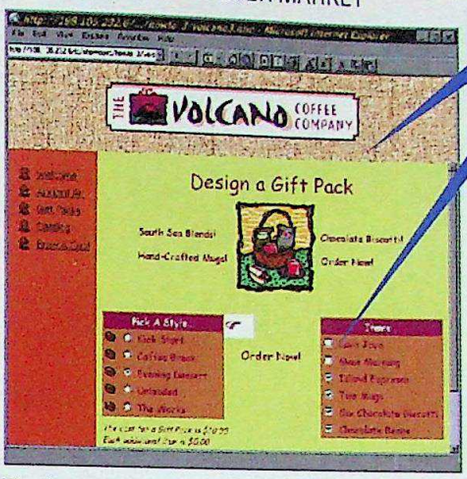
In the opening keynote address at Microsoft's recent Professional Developers' Conference, Paul Maritz, vice president of the Microsoft platforms group, drew a road map of the company's Internet strategy. Chief among the announcements was the unveiling of the ActiveX platform, which competes directly with Netscape APIs and Sun Microsystems' Java and JavaScript.

ActiveX is a cross-platform strategy with the stated goal of "moving us from the world of static Web pages to active online content." Other announcements discussed Internet Explorer 3.0, due this summer; several ActiveX controls supporters; a digital signature initiative; a licensing agreement for Sun's Java language; and an agreement with Progressive Networks for delivering video and audio on the Web.

Maritz compared the early stages of the current "communications revolution" developing around TCP/IP and the Web to the early stages of the PC revolution, built around DOS and spreadsheets. The portion of the keynote speech that got the most favorable audience reaction—other than a demo from Steve Jobs using his Web Objects software with Microsoft's ActiveX controls—was the demonstration of Internet Explorer 3.0. This new version combines Internet Explorer's interface with Windows 95's Explorer interface.



Internet Explorer 3.0 lets you jump to the Web and your files.



Microsoft's Bill Gates and America Online's Steve Case also confirmed that that they'd achieved a far-reaching strategic alliance. AOL has agreed to make Microsoft's Internet Explorer the standard, built-in Web browser for its more than five million customers. In return, Microsoft will give Windows 95 users access to America Online by incorporating it within an "online services" folder found directly on the Windows 95 desktop.

Gates said that other online services could be expected to show up as icons on Windows 95's desktop as well.—*Sebastian Rupley*

...Rivals Predict Sea Change

Netscape, Sun point to end of Microsoft's lock-in strategy.

In a keynote speech in front of a packed house at San Francisco's Netscape Developers' Conference in March, Sun Microsystems' Eric Schmidt painted a picture of an Internet-, intranet-, and Java-dominated future that he said could topple the client/server model and seriously threaten the Microsoft/Intel–dominated PC platform.

Schmidt positioned 1996 as the crucial period within which Netscape and Java can establish a meaningful new computing platform. "Microsoft will tell you there's no major paradigm shift," he said, "because they just want to extend incrementally what already exists." He referred to Microsoft's dominance as being based on "API lock-in strategies," and painted a picture of "a simple, virtually bug-free future operating system that sits and waits for components to arrive over a central network." The OS would outrule lock-in strategies designed to keep one vendor dominant, said Schmidt.



SIMPLE SERVER: *Netscape's FastTrack Server, with its simple interface, is targeted at those without much experience managing a Web server.*

Schmidt also focused on solutions to existing bandwidth problems and bottlenecks. Cable modems—as opposed to "unfriendly" ISDN—figured large in his perception of the Internet's future. He pointed to promising cable-modem trials in Sunnyvale, California, and described the guts of the typical cable as consisting of a television line for NTSC video signals, a second phone line, and an RJ45 plug for 10Base-T Ethernet.

Sun's Java, of course, was central to Schmidt's vision. "HTML content is static," he said, "but Java will change the paradigm by replacing static data with live applications and interactive multimedia." He applauded recent developments designed to accelerate Java.

"The biggest complaint we've had about Java is that it's an interpreted language," he said, but "a new breed of just-in-time compilers will speed things up by compiling on the fly." He singled out Borland's new C++ development suite as a prime example, and also said that Sun's PicoJava and MicroJava accelerator chips would be available by summer.

The crowd at the conference and Schmidt's speech reflected a distinctly anti-Microsoft theme. In an apparent reference to both Microsoft and IBM, Schmidt said, "We've had forty years now of one vendor dominating computing, and a new platform which outrules API lock-in strategies could change that."—*Sebastian Rupley*

Top Business Software

1	Microsoft Windows 95 Upgrade	Microsoft
2	Microsoft Plus! for Windows 95	Microsoft
3	Netscape Navigator Personal Edition	Netscape Communications
4	First Aid	Cybermedia
5	CleanSweep 95	Quarterdeck
6	VirusScan	McAfee
7	UnInstaller	MicroHelp
8	QEMM	Quarterdeck
9	Norton Antivirus	Symantec
10	Remove-It 95	Vertisoft

Source: PC Data. Data for January 1996. Additional lists at *http://www.zdnet.com/pcmag/topten/topten.htm.*

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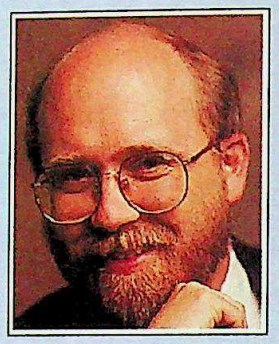
PIPELINE

By Jake Kirchner

On the Web, You Get What You Pay For

Every Web surfer's dream is free access to free information. But even as Internet access costs spiral downward, in the face of increased competition, the cost of producing content that attracts large numbers of viewers continues to rise. As those of us who have invested large sums in our Web sites can attest, real content costs real money. The result is an unmistakable trend toward subscription-supported and pay-per-view models for the best information on the Web.

The exceptions will be the relatively few sites that are successful at attracting significant advertiser support. Unfortunately, there just aren't enough ad dollars to support all the sites already trolling for ads. Even phenomenally successful sites (in terms of hits), like search services Lycos and Yahoo!, currently pull in less than a million dollars per month in ad revenue. Not bad, but still insignificant in the grand scheme.



It's no surprise that the Web sites of media giants are subscriber-supported.

Furthermore, since the overwhelming majority of Web ads are from the computer industry (and are primarily Web-related), the content providers most able to obtain those ads are the media companies already in those markets. The adoption of the Web as a medium for mainstream advertising will be gradual. And the total pot of all ad dollars doesn't grow quickly enough from one year to the next to support all the current forms of media—print, broadcast, direct mail and so forth—let alone the thousands of new Web sites hoping for advertiser support.

So it's no surprise that the Web sites developed by mainstream media companies—such as Dow Jones and Co., ESPN, Knight-Ridder, and The New York Times Co.—are, either entirely or in part, subscriber-supported services. *WebWeek* recently reported on a Kelsey Group survey that found that 26 percent of online daily newspapers and 56 percent of online weekly newspapers plan to charge subscription fees.

I suspect many of us would be happy to forgo the pleasure of advertising on many of our favorite sites. Although being able to link directly to the advertiser's own site is potentially a real benefit to online ads, no one likes the annoyingly prominent placement of the ads (necessitated by the small amount of space available for content, much less commercial messages). One of the worst offenders is the pointcast network, an otherwise truly interesting news service, which insists on flashing ads at you as you try to read the content. Imagine trying to watch an NFL game on TV while beer ads flash at you nonstop from the center of the screen.

For longtime Internet users, the commercialization of the Web is one of the really disappointing developments of the past couple of years. Still, on the plus side, access costs are dropping. AT&T's decision to offer free Internet access to its long-distance customers, for example, will help drive down access costs for everyone as competitors scramble to keep up. And a variety of high-speed network access technologies are becoming more widely available, foreshadowing a drop in those prices as well.

Who knows, maybe we'll save enough in access costs to be able to pay for the content that makes the access worthwhile.

Fusion, Ferroelectric, and Fast

Memory breakthroughs promise cheap speed.

Amid the frenzy stirred up by the Internet, some important technologies aren't getting the attention they deserve. One good example: the memory expected to handle all the cool multimedia applications the Web is going pump into your PC over high-bandwidth connections. Several manufacturers have been working on memory chips that are up to the task.

IDT, a longtime player in the memory chip field, has developed fusion memory—so-called because it combines the low cost of DRAM with the high performance of SRAM. Fusion chips pack more bits on a single chip than SRAM and can access data nearly as fast as SRAM. IDT predicts fusion will replace SRAM chips over the next few years.

The memory interface design, chip-fabrication process, clock rate, and density of bits per chip determine the speed at which data can be fetched from memory; that speed is known as access time. DRAM is the slowest, averaging 50 to 70 nanoseconds. SRAM, significantly faster, has access times of 5 to 15 ns. Fusion clocks in at 10 to 20 ns. Fusion memory also requires less power than SRAM, making fusion appropriate for battery-conscious notebooks.

But developing the technology is only part of the challenge. A sweeping transition to new technology requires building the support of vendors and manufacturers

NEC is testing another fast replacement for DRAM called ferroelectric memory (FeRAM). FeRAM is designed with flash memory, so the chips retain data when the power is cut. NEC expects FeRAM chips to debut commercially in three years.

Meanwhile, Rambus, which has been pushing its own revolutionary memory technology—targeted at the video card market—for years, has recently solved a big deficiency in that technology. Its latest design of Rambus DRAM (or RDRAM) can transfer data at 600 MBps—two to three times as fast as the data transfer rates of typical video memory—while RDRAM chips excel at the rather ordinary task of streaming video. Until recently, RDRAM exacted a performance penalty when dealing with other types of data that required more complex use of the memory chip, such as random access. Later this year, newer versions will reduce latency significantly, opening opportunities for high-speed applications.

But developing the technology is only part of the challenge. A sweeping transition to new technology requires building the support of vendors and manufacturers. IDT says it has the support of chip-set vendors, and it expects a transition to fusion memory within the next 12 months. And Chromatic Research, Cirrus Logic, Nintendo, and Silicon Graphics have announced systems using Rambus technology.—*Carol Levin*

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

DIGITAL PHOTOGRAPHY

Minolta's RD-175: The Professional's Choice for Electronic Photography

By Daniel Grotta and Sally Wiener Grotta

The $9,995 Minolta RD-175, from Minolta Corp., is the first midrange digital camera to dip below a five-figure price tag—albeit just barely—yet produce stunning high-resolution 24-bit color images. The RD-175 is a good choice for computer users who need professional-quality digital photographs for publication, whether on the World Wide Web or in print.

The RD-175's specifications are impressive compared with those of the $12,780 Fujix DS-505 (also sold as the Nikon E2) and the $11,995 Kodak EOS DCS 5. The RD-175, which is based on the body of the Maxxim 500si camera, is both smaller and lighter than the boxy DS-505 and the elongated DCS 5. Its 1,528-by-1,146-pixel resolution yields more detail than the DS-505's 1,280-by-1,000 and the DCS 5's 1,524-by-1,012 images.

The RD-175 is the first camera to use a beam splitter and three linear charge-coupled device (CCD) targets (two green CCDs and one combination red-and-blue CCD). The primary advantage of this arrangement is that the three medium-resolution CCDs are easier to make and less expensive than a single high-density CCD. The three-way approach also yields better separation of the three color channels that constitute an image, which virtually eliminates color aliasing, or imperfectly aligned colors.

The RD-175 uses a 131MB Type III PC Card hard disk to hold up to 114 images. This is a slightly higher capacity than the DCS 5's 105MB Type III PC Card, which can store 62 images, or the DS-505's 25MB Type II PC Card, which can hold 84 images. The RD-175 produces the largest image files (5MB), the DS-505 produces 3.7MB files, and the DCS 5 produces 4.5MB files. The penalty is that the RD-175 takes 4.5 seconds to get ready for its next shot. The DCS 5 can shoot a burst of up to ten frames in a little over 4 seconds, and the DS-505 can click off a

Continues on page 18



POINT AND SHOOT: *Minolta's digital camera, the RD-175, is light and easy to operate.*

Read **First Looks** for information on the latest product releases in India and the rest of the world.

GRAPHICS ADD-ONS

Kai's Power Tools 3 Sets Graphics Editing in Motion

By Luisa Simone

Kai's Power Tools 3 is like a multivitamin that adds nourishment and energy to your image-editing program. This $199 collection of filters from MetaTools (formerly HSC Software) boosts the power of the host illustration or image-editing program so much that it's often hard to recognize the original software.

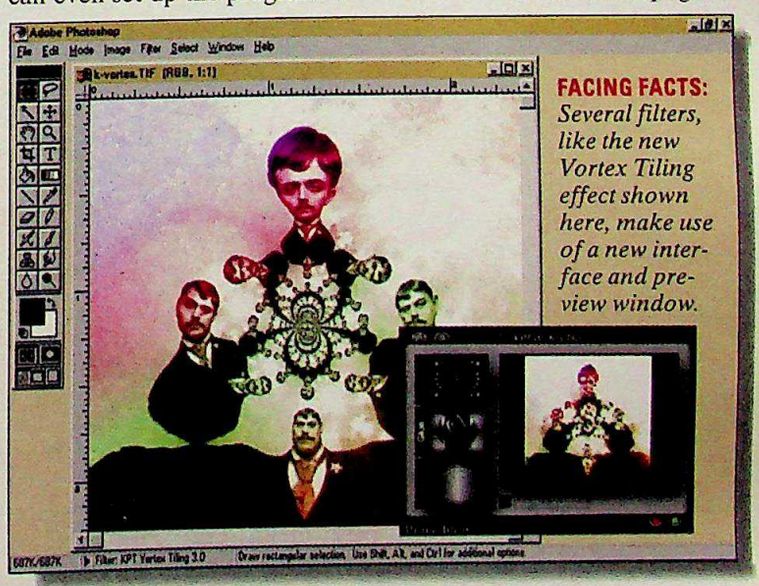
This third iteration of Kai's Power Tools (KPT 3) continues to deliver an amazing assortment of Adobe Photoshop Plug-in filters but now runs natively in Windows 95 and Windows NT and adds a new miniapplication called the Spheroid Designer. The bottom line is that whether you're generating a shiny blue marble or a red sand-dune planet, you'll find the Spheroid Designer can take you as far as your creativity can go.

The flexibility of KPT 3 is unprecedented. For example, you can independently set up four light sources (five if you count ambient light) to shine at different intensities, with various colors and customized highlights. You can even set up the program to pull color from a globe rather than illuminate it, producing an intriguing effect not unlike that of a black hole.

The realism of the three-dimensional effects created is enhanced by the ability to assign bump maps to surfaces. You can also control the concavity and transparency of an object.

KPT 3 has also made the leap from still imagery to moving images with the addition of

Continues on page 19



FACING FACTS: *Several filters, like the new Vortex Tiling effect shown here, make use of a new interface and preview window.*

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Minolta RD-175

Continued from page 17

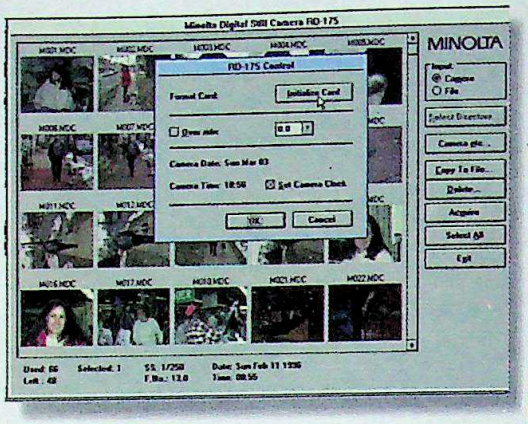
frame every second.

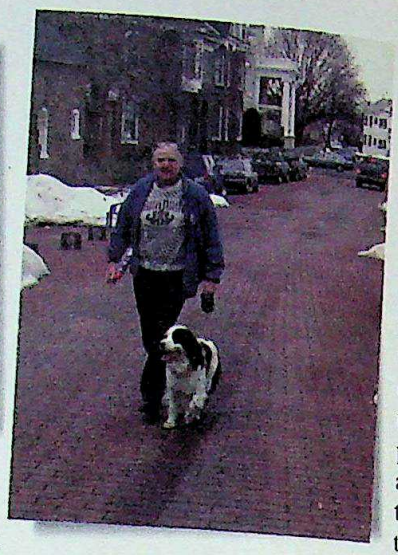
In addition to swappable PC Cards, these cameras have alternative ways to move images to your PC. The DS-505 communicates through its RS-422 video port, the DCS 5 has a SCSI interface, and the RD-175 has a SCSI-2 interface.

Just turn on the RD-175, compose your picture, and shoot. The camera is light and well balanced, and because it uses an optical condenser, you see a full frame through the viewfinder. The DCS 5 awkwardly displays the image on a smaller frame at the center of the viewfinder.

The downside of using a viewfinder condenser is that the RD-175's maximum aperture is f6.7, which allows relatively little light into the camera. The RD-175 compensates by using a very light-sensitive target that is the equivalent of ASA 800 film, and it is the only camera in its class with a built-in flash.

At first we had difficulty warming up to the camera. The auto-focus mechan... responds slow... and the focus ... peared impre... In any event, ... our images w... perfectly sh... Another irritat... is that the min... return is slow, bu... view of the ca... era's slow recycl... time, this is no... practical consid... ation. It isn't diffi... to use the camera ... the shutter/apert... priority or manual mode, but t... status readouts are not visible ... the viewfinder. Finally, the ... Card hard disk uses the stand... ATA format, but the SCSI-2 ... terface requires a special cable.





WALKING THE DOG: *The RD-175's desktop (top) lets you off-load your photos via a PC Card or through its SCSI-2 interface. Image quality (right) was excellent over a range of subjects and conditions.*

In spite of its high-end asp... tions, the RD-175 lacks meter... and focus modes, high-spe... flash synchronization, fast ma... al operations, and professiona... quality interchangeable len... and accessories.

Minolta's driver installs into a... 16-bit Twain-compliant grap... program; it does not work in W... dows 95 or Windows NT. The ... ages are in a proprietary form... and on our 486DX2/66 test syst... with 16MB of RAM, it took ... average of 2 minutes 56 secon... to acquire and decompress ea... image. An added bonus is t... shutter speed, f-stop, flash, ... time/date information are a... matically stamped on each fra...

The images from the RD-... camera were consistently am... the best we've seen. Edges w... sharp, and colors were vivid ... realistic, especially with diffi... to-reproduce flesh tones.

The Minolta RD-175 strike... elegant balance between ex... lent image quality and m... quirks that distract from an ot... wise well-designed digital cam...

Minolta RD-175. List price: $9... Requires: 16MB RAM, 30... hard disk space, Microsoft W... dows 3.1 or later, SCSI-2 h... adapter with driver or Type II s... Minolta Corp., Ramsey, NJ.

(Indian partner Deltatec, 20 Pycrofts Garden... Nangambakkam, Madras 600 006. Tel: ... Fax:8231489.)

Epson's PhotoPC Keeps It Simple

Bucking an industry trend toward smaller, more sophisticated filmless cameras, Epson's $599 PhotoPC is larger than most 35-mm point-and-shoot cameras.

Simplicity is the watchword here. All of the controls are clear and unambiguous: an on/off switch on the front of the camera and an information panel on the top with buttons for the timer, selecting high or low resolution, erasing the last picture, and activating the built-in flash. The large frame counter shows both the number of shots taken and those left. The only other icon shows battery status.

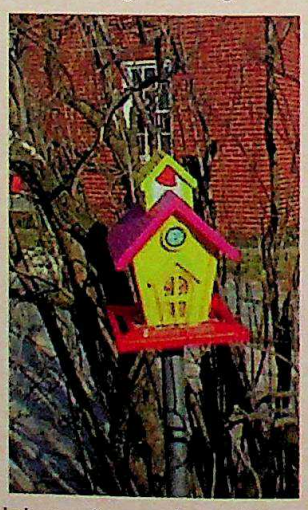
The PhotoPC is a basic fixed-focus camera without adjustments for f-stop or shutter speed. But when it's tethered to a PC, you can adjust the shutter speed from 1/30 to 1/10,000 of a second. The lens coverage is about what you'd get with a 43-mm lens on a 35-mm camera, and its equivalent film speed is a slow ASA 130.

Turning the camera on opens up the lens cover. If you don't snap a shot within a minute, the PhotoPC enters a power-saving sleep mode. After each shot, the camera takes approximately 5 seconds to recycle. The PhotoPC can capture up to 16 high-resolution (640- by 480-pixel) or 32 standard-resolution (320- by 240-pixel) images, or some combination of the two, in its 1MB flash memory. Optional 2MB and 4MB flash-memory modules can raise the maximum capacity to 160 standard images.

At about 57K, it takes approximately 16 seconds to upload and decompress each image. Each image is saved as a JPEG file that occupies about 900K. Images are captured at 24-bit color, and all of our test shots were sharp, with good color saturation and fidelity and minimal aliasing.

The PhotoPC's 37-mm lens thread permits the addition of third-party accessories, but there is no provision for viewfinder lenses, so you will have to guess what you're shooting at. The PhotoPC comes with Storm Software's EasyPhoto, which includes image-editing tools for adjusting brightness, color, contrast, cropping, and size.





NEAR AND FAR: *The PhotoPC captures 24-bit images with a depth of field from 2 feet to infinity.*

Epson's PhotoPC is just as impressive as it is inexpensive.

PhotoPC. List price: $599. Requires: 8MB RAM, 15MB hard disk space, Microsoft Windows 3.1 or later. Epson America Inc., Torrance, CA.

(Indian partners Digital World, Bombay; IT&T, New Delhi; Redington, Bangalore; Wipro Bangalore.)

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KPT 3

Continued from page 17

automated animation functions. Using the new Interform module, you can create moving textures in .AVI format that can dress up a multimedia presentation.

A FAMILY AFFAIR

Interform is closely related to KPT's now-classic Texture Explorer in that it uses a genetics metaphor to produce a variety of new images. The result is animation that is the offspring of two source (or *parent*) patterns.

The parents are in reality nothing more than Texture Explorer presets. You can alter the direction and velocity of each parent texture, and you can determine how much the "child" will resemble either of its parents.

Animation functions can also be found hidden deep within the Spheroid Designer. A nested module called the Genesis Editor lets you transform your sphere by multiplying it and then arranging the copies in branching or radiating patterns, altering their size, and rotating them in space.

Regardless of whether you create moving textures or spheres in motion, you'll find the movie-production controls simple but effective for creating many different effects. The biggest time-saver is KPT 3's iconic filmstrip, which lets you designate up to ten keyframes of up to 10 seconds each for your animation files.

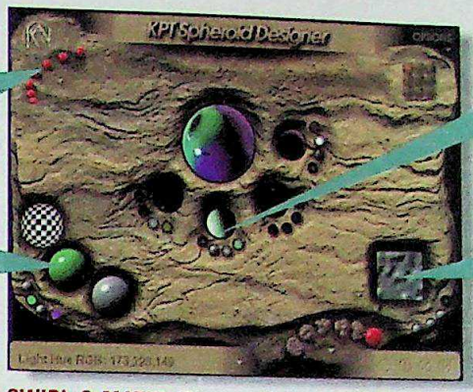
Completing the list of wholly new functions are several special-effects filters that push and pull a picture's pixels like a fun-house mirror or a kaleidoscope. Indeed, filters such as Planar Tiling, Twirl, Video Feedback, and Vortex Tiling can transform a basic image into an original work of art with the click of a button.

The changes that have been made to long-standing KPT functions are no less impressive. Both the Gradient Designer and the Texture Explorer have been improved with larger preview windows that show how each effect will interact with the current selection. Choosing a Preset effect is also easier, thanks to the addition of thumbnail previews, which show you exactly what a "Giraffe Sportcoat" or a "Cactus Pillow" looks like.

KPT 3 lets you modify gradients and textures to a much greater extent than ever. There are controls for hue, saturation, brightness, contrast, blur, and color cycling.

As good as these changes are, longtime KPT users will likely be disappointed to find that the new Texture Explorer no longer creates repeating patterns and that it relies on totally new algorithms to generate textures. This renders all of your Preset textures from earlier versions unusable in KPT 3.

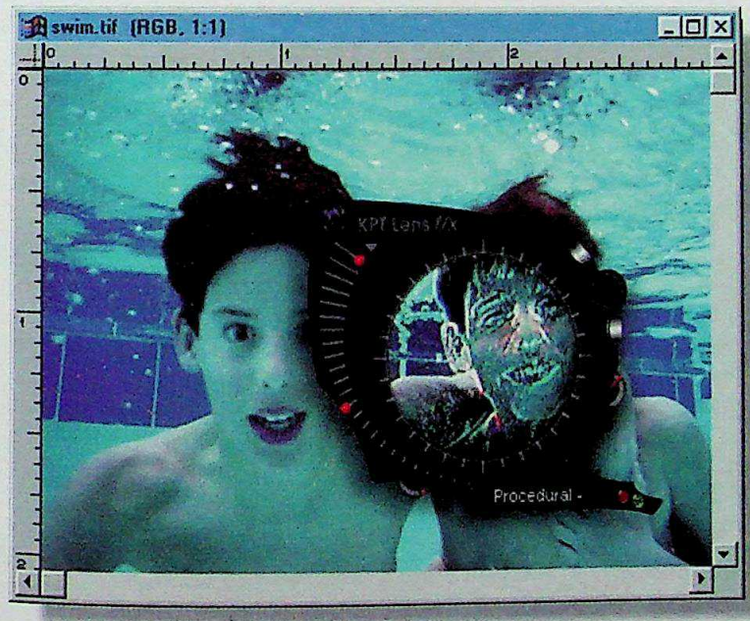
MetaTools recognizes the importance of these features for digital artists. As a result, this program includes Version 2.1 of the Texture Explorer (and the unchanged Fractal Explorer).



SWIRL-O-MATIC: *The new Spheroid Designer lets you create complex, realistic objects.*

NEW FACE ON GRAPHICS

There are also major changes to the interface. In true KPT tradition, Version 3 eschews menus and dialog boxes in favor of clickable buttons and draggable dials. Indeed, you can often drag directly inside a preview window to alter the angle or intensity of an effect.



AUTO-FOCUS: *A virtual lens, which can be moved to different screen positions, lets you view an image through a special-effects filter.*

To that foundation, KPT 3 adds two entirely new interface elements: a floating control panel (called the Compact UI) and a virtual camera lens (called a Lens f/x). In many cases, these new interfaces consolidate multiple filters into a single tool. For example, the Pixel f/x lens replaces five separate filters from KPT 2.

Still, you get all of the power of the older filters and a little bit extra. From within Pixel f/x, the Page Curl filter lets you interactively pull a page curl of any size from any corner of an image.

The new interface also adds several important options to the filter effects that were previously available only in the Gradient Designer and Texture Explorer. Now you can change an image's opacity and choose an Apply mode (such as a procedural blend) before you apply an effect to an image.

PENTIUM POWER

In the past, KPT has had only one requirement—a host program that supports the Photoshop Plug-in filter specification. KPT 3, however, specifically requires the more robust operating environment of Windows 95 or Windows NT. Our testing also revealed that you'll need a Pentium processor and the latest generation of video adapter to get the most out of the program.

KPT 3 comes on a CD-ROM, which allows MetaTools to include hundreds of preset gradients and textures, a collection of bump maps, and dozens of tips and tricks from Kai Krause, the program's creator. But even without these bonuses, KPT 3 is a great value that can increase your productivity while it enhances your creativity.

Kai's Power Tools 3. List price: $199; upgrade, $79. Requires: 8MB RAM, 10MB hard disk space, Microsoft Windows 95 or Windows NT, host application that supports the Adobe Plug-in specification, CD-ROM drive. MetaTools Inc., Carpinteria, CA. *(Indian partner Wipro, 88 MG Road, Bangalore 560 001. Tel: 5588422; Fax: 5588657.)*

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ELECTRONIC ORGANIZERS

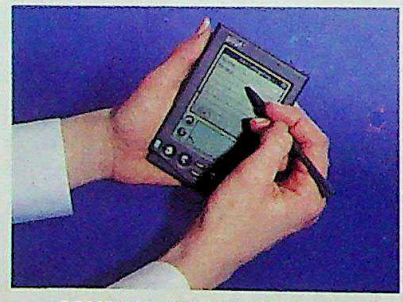
Pilot 5000: From the Cradle to Your Pocket

By Rick Ayre

The Pilot 5000, a $369 electronic organizer, has an identity problem: It is neither a full-fledged hand-held computer nor a desktop computer accessory, and therein lies its value. Designed by U.S. Robotics, the diminutive Pilot comes with a powerful suite of pen-based organizer applications and has a unique cradle that connects to your PC, making it a snap to keep your data in sync. The more you use it, the more the Pilot becomes a natural extension of your PC.

Though it's no match for the larger Apple Newton or HP OmniGO, the Pilot packs more computing power than a BOSS or Wizard organizer into a near-perfect shape and size. It measures only 4.7 by 3.2 by 0.7 inches and weighs 5.5 ounces. It slips easily into a shirt pocket and is slim enough to fit comfortably in even small hands. About the only criticism that can be leveled at the hardware configuration is that the desktop connection requires a dedicated serial port—a scarce commodity on some systems.





COMPACT COMPANION: *The Pilot feels comfortable in the palm of your hand and fits easily into a shirt pocket. The ingenious cradle (right) makes the Pilot an extension of your desktop PC.*

The Pilot's 3.4-inch monochrome screen is readable in nearly all conditions, except for direct sunlight. Although the display feels small, the Pilot's software makes efficient use of the limited screen real estate with a clean, uncluttered interface and a bold, easily readable typeface.

The Pilot has no modem or PC Card slot. Rather, the key to its communications abilities is the Pilot's cradle. With a footprint slightly smaller than that of a 3.5-inch floppy disk, the cradle holds the Pilot securely in an angled position and has a serial cable to connect it to your desktop PC. To synchronize and back up the data on the hand-held device, simply slip the Pilot into the cradle and press the HotSync button in the lower-right-hand corner.

Synchronization is fast and simple. It took about 15 seconds to transfer a day's worth of appointments and update a handful of contacts, to-do-list items, and memos.

The Pilot comes with a complete set of PC-based organizer applications called the Pilot Desktop, a 32-bit suite that runs fine under Windows 95. If you are still using Windows 3.*x*, you must install the included Win32s files to use the Pilot's software. The software was still in the beta stage during our testing but ran without incident.

The Desktop suite includes an address book, a calculator, a date book, a memo pad, and a to-do list. The find feature, which lets you search for text strings contained in documents created with any Pilot application, is a real time-saver. All the applications have desktop companions that make it easier to input data with a keyboard or print via your dedicated printer. We were pleased with the responsiveness over a variety of chores, from updating a calendar to calculating the tip on a dinner bill.

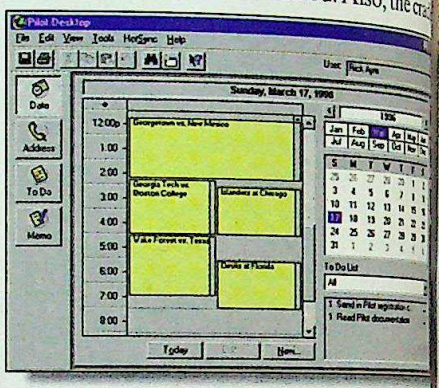
The Pilot's center of attention is its date book. Though it may lack some of the features of a high-end PIM, such as the ability to print in many output formats, it offers all the basics. Without even consulting the documentation, we were quickly able to schedule an appointment, check for conflicting events, write reminders for events such as birthdays, and print a simple schedule.

There are three ways to enter information into the Pilot. The first method is to transfer data from the Desktop applications. A second way is to touch-type on a screen-based keyboard on the Pilot's display. Finally, you can use the Pilot's pen to write on the touch-sensitive section below the screen. This last method takes a bit of getting used to, because you have to use the Pilot's handwriting-recognition software, Graffiti. But once you get the hang of it, it is nearly 100 percent accurate.

The Pilot 5000 we tested had 512K of memory and could hold approximately 5,000 records, 2,500 contacts, 500 to-do-list items, and five years' worth of appointments, according to U.S. Robotics. The Pilot 1000 ($299) has one-quarter as much memory and can handle about one-fifth the amount of data, including a year's worth of appointments.

Still to come are Pilot accessories, such as a modem connection. Also in the works, according to U.S. Robotics, are data translators for the most popular PIMs, such as Day-Timer Organizer, Ecco, Lotus Organizer, OnTime, and SideKick.

There is much to like about the Pilot, as long as you're willing to take the time to learn Graffiti. But we have some concerns about the early models we saw. Though they are small, light-weight, and fast, they don't feel well constructed. Also, the cradle is an efficient way to transfer data, but it doesn't charge the pilot of AAA batteries required by the hand-held unit, and there's no back-up battery. When your batteries run out, you have only 3 minutes to replace them, or you will lose all data on your Pilot. Of course, you don't have the data on your desktop PC, so the moral is to be sure that you back up your Desktop files frequently.



PILOT DOES WINDOWS: *The Desktop software tightly integrates the device with Windows 95 on your desktop PC.*

DECISION MAKERS READ PC MAGAZINE INDIA

Nevertheless, the Pilot is an innovative entry in the world of hand-held computing, a field that many had come to think of as moribund.

Pilot 5000. Estimated street price: $369. Requires: 8MB RAM, 5MB hard disk space (for Windows 95) or 9MB hard disk space (for Windows 3.1 or later), serial port. U.S. Robotics, Palm Computing Division, Los Altos, CA. *(Indian partner Microsense Computers; 808 Embassy Center, Nariman Point, Bombay 400 021; 2872948; Fax: 2836643.)*

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MONITORS

NEC's MultiSync M500 Monitor Is More Than Just Another Pretty Face

By Ste e Buehler

NEC's first desktop multimedia monitor—the $599 NEC MultiSync M500—combines innovative screen technology with unique industrial design to produce a one-of-a-kind visual experience. The result is a monitor that produces a great picture and is also a striking piece of visual sculpture for your desktop.

The M500 uses a 15-inch-diagonal cathode-ray tube (CRT) that yields 13.8 inches of display space. From the start, the M500 monitor has been designed to handle high-resolution work demanded in business environments. The M500 uses what NEC calls CromaClear, which consists of a sophisticated vertical slot mask, normally found on television tubes, and a new phosphor layout that results in the close positioning of adjacent electron-gun beams.

This combination of oval phosphor dots and the slot mask results in more radiated energy from the phosphors passing through the mask. And because the phosphor dots are closer together and brighter, the image appears clearer and brighter. This design also minimizes electron-beam energy dissipated onto the slot mask itself, which in theory should contribute to both brighter pixels and a longer life expectancy for the CRT.

THE MONITOR'S VOICE

The M500 adds speakers to an NEC monitor for the first time. Built into the lower corners of the monitor case, these 2-watt speakers had a frequency response of 230 Hz to 18 kHz, ±6 dB. This is a good frequency range for built-in speakers, and the audio quality was acceptable for most business applications, but you won't mistake them for quality external speakers; anything with wide dynamic range or high sound levels sounded thin.

NEC has added sound-mode controls—accessible through the monitor's On Screen Manager (OSM) program—to let the user tailor the audio output. The default Voice/Standard mode passes sound through to the bass and treble controls. The Music/Game and Movie/TV modes modify volume and add minor phase variations between speakers. The Mono to Stereo mode separates certain frequencies across each speaker to give the impression of stereo output. Volume and balance controls are accessed through the OSM; there's also a convenient mute button on the front panel.

Another new feature is Video Boost, which is meant to compensate for the general darkness of video images. This lets the user increase the brightness and the perceived clarity of the monitor's image. Starting at the center of the screen, the user can boost one-quarter, one-half, or all of the screen's real estate. The effect is a much brighter rectangle in the center, which can be especially effective for games, in which much of the action takes place mid-screen, or for a video clip running in a centered window.



DESKTOP SCULPTURE: *The NEC MultiSync M500 presents a radical take on the shape of a monitor and how the screen image is formed (inset).*

Setup and installation of the monitor were a snap. The monitor is Plug and Play– and DDC-2–compliant, and NEC's OSM gives easy access to controls. Basic screen adjustments for setup were simple. OSM doesn't include the screen corner-geometry controls of high-end NEC monitors, but this monitor's images looked great without them.

Using a MicroVision SpotSeeker III and a Minolta CRT Color Analyzer CA-100, ZD Labs ran the M500 through its paces. (For details, see "Bigger Windows," September 12, 1995.) The M500 achieved very good Average MTF (modulation transfer function) scores compared with other 15-inch monitors. We detected no graininess, even on our small-text tests. Spatial Uniformity, which measures the consistency of the luminance across the entire screen, was also very good. The M500 also showed excellent Pincushioning results as well as good Color Tracking and Misconvergence scores.

THE SOUNDS OF RADIATION

The objective measurements were borne out in subjective evaluations. This monitor delivers crisp and clear images, with excellent all-around clarity and brightness. The monitor passed MPR II emissions testing, and testing with the speakers showed only a small increase in radiation emissions.

At $599, this 15-inch monitor is highly competitive. The new CromaClear screen is a distinct technological step forward, and the image clarity shows the positive results.

This is a solid business multimedia monitor wrapped in a case that you either love or hate. For a relatively low price, you can get NEC's reputation, great monitor technology, and a pretty radical design in one package.

NEC MultiSync M500. Estimated street price: $599. Requires: VESA-compatible video output. NEC Technologies Inc., Boxborough, MA.

(Indian partner Digital World India, Bombay; Byte Systems, Calcutta; Tata Elxsi, New Delhi.)

BENCHMARK TESTS

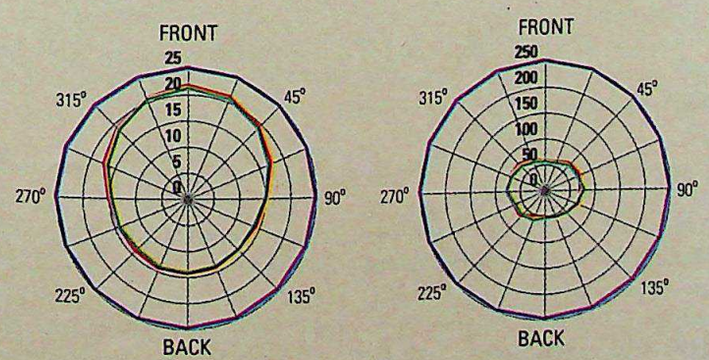
NEC MultiSync M500

PC MAGAZINE LABS

The NEC MultiSync M500 achieved scores that ranged from good to excellent for clarity, sharpness, and brightness. In addition, the monitor passed MPR II emissions testing, although turning on the speakers did increase the monitor's emissions slightly.

ZD Labs used a MicroVision SpotSeeker III to gauge the monitor's performance.

VLF Magnetic Emissions (nT) ELF Magnetic Emissions (n



— MPR II maximum — NEC MultiSync M500: speakers off — NEC MultiSync M500: speakers on

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INTERNET UTILITIES

Puffer 2.0 Buys You Some E-Mail Security via Easy Encryption

By J.W. Olsen

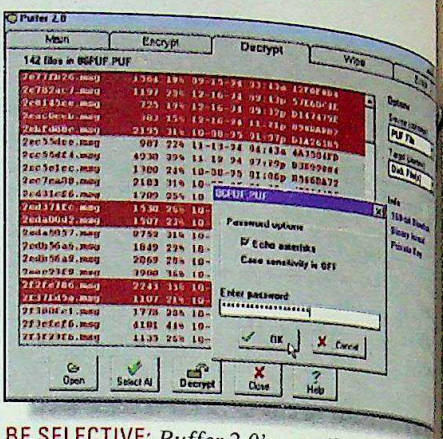
If you exchange sensitive information over the Internet, you probably use multiple tools to encrypt, merge, and compress files, convert the results to seven-bit ASCII, and splice the files to meet Internet e-mail limitations. Kent Briggs' $29 Puffer 2.0 is a deceptively simple program that secures data for e-mail or for safe storage on your hard disk.

For input, Puffer accepts files from disk (up to 1,000 files in one operation), the Windows Clipboard, or a built-in editor roughly akin to the Windows Notepad. You select the type of encryption and choose whether or not to compress the data. Unlike public-key encryption, Puffer requires the same password to encrypt and decrypt a file.

Puffer offers two symmetric encryption algorithms. PC1 is a fast, 40-bit stream cipher based on the RC4 encryption algorithm and provides some of the tightest security allowed for export. Puffer's slower, 160-bit, variable key-size Blowfish alternative is based on a 16-round Feistel scheme and provides an extra level of security, but it can't be exported.

On our informal tests using a variety of files, Puffer's compression algorithm, LZ77, compressed e-mail files nearly as well as PKZIP.

Output targets include Puffer's editor and the Windows Clipboard—which is handy for insertion into e-mail documents or disk files. Output format can be binary (for generating the smallest files), seven-bit ASCII (for e-mail), or self-extracting .EXEs (for recipients who don't have Puffer). A feature splits ASCII output into file sizes that you specify, which is required by some e-mail systems. In case you're compulsive, you can use Puffer to remove all traces of the unencrypted original data from your system.



BE SELECTIVE: *Puffer 2.0's e-mail security system lets you select and restore individual files within its .PUF files to their original state.*

Puffer 2.0 provides a secure, one-stop solution for your encryption needs at a price that's hard to beat.

Puffer 2.0. List price: $29. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 3.1 or later. Kent Briggs, Hewitt, TX.

(No Indian partner.)

WEB-SITE SOFTWARE

DeltaPoint's One-Minute Web Site

By Todd Spangler

DeltaPoint's $99.95 QuickSite 1.0 is a flexible, smart tool that allows just about anyone to whip up a simple and consistent World Wide Web site in record time. Although it is intended for Web novices, the product's text-only HTML editing screen and limited toolbar make it less than user-friendly.

When you start a new Web site in QuickSite, a wizard prompts you to input the fundamental information used for the entire site (such as title and background image). You can set all the pages on your site to have the same design elements: background images, headers and footers, and line rules.

You choose from three site structures, each with various basic configurations of text pages, menus, URL menus, and file-download menus. In the main QuickSite window, all your pages and other elements are listed, along with the type, filename, date and time of creation, and status of each.

You can set the status of a page as *active* (which generates the page normally), *under construction* (which inserts a yellow construction graphic on the page you've created), *hidden* (which generates an HTML page but doesn't link it automatically to the home page or a menu), or *suspended* (which excludes the page altogether).

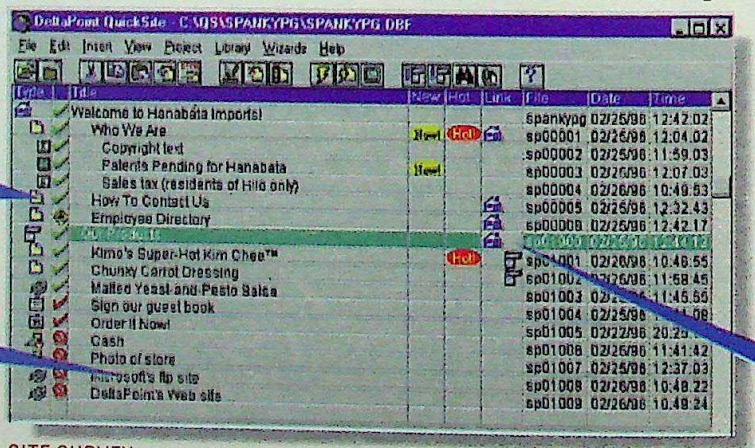
Unlike other Web management tools, such as NaviSoft's NaviPress and Microsoft FrontPage (the latter was reviewed in First Looks, February 20, 1996), QuickSite doesn't let you create and edit pages directly on a Web server. Instead, the pages and text are stored locally in a .DBF database format. When you select Build Site, the program automatically generates all the HTML pages based on your formatting selections.

The program's Publish option exports all required graphics and HTML pages into a single directory and then automatically sends everything via FTP to your Internet service provider. QuickSite includes no HTML viewing capability; you need to launch a Web browser to check the site.

Because a QuickSite site is a self-contained database file, you can easily reuse images, page and other elements with a feature called *caret notation*. For stance, if you've already defined *PC Magazine* as a hypertext link to *http://www.pcmag.com*, you only need to include the text "^PC Mag^" in other documents to include the link. If you redefine the original link (say, to *http://www.zdnet.com/pcmag*) and then rebuild the site, all ^PC Mag^ links will automatically be updated.

In addition to linking to

Continues on page



CONSTRUCTION AREA: Icons in this window display the status of each page: active, under construction, hidden, or suspended.

BIRD'S-EYE VIEW: QuickSite makes it easy to identify pages on your site.

MAKING CONNECTIONS: The main window shows all of the links to the home page and those between pages.

SITE SURVEY: *QuickSite's main window displays information on all pages and other elements, including title, type, filename, and any links.*

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QuickSite 1.0

Continued from page 22

elements in your project, QuickSite includes a library of useful graphics, text, forms, and URLs to Web-authoring sites. And if you've created HTML pages using another tool, QuickSite lets you link them. We had problems when we tried to publish a Web site that included external links. QuickSite did not include all the linked .GIF images from the library in the Publish directory; nor did it include the external HTML pages that we linked to the site. As we went to press, DeltaPoint released a fix for these problems.

QuickSite's text-only HTML editing screen is not nearly as easy to use as those of dedicated HTML editing programs, such as SoftQuad's HoTMetaL. As a result, you'll need to be familiar with HTML or learn quickly.

Another drawback is QuickSite's lack of validation tools. There is no HTML validation feature, so if you've made a mistake with your HTML tags, you must locate and correct the error manually. The program also does not verify URLs referenced from the site's pages, as do FrontPage and NaviPress.

Although QuickSite displays your pages in a hierarchical structure, you can't view all the links between pages or those to external URLs. Unlike with NaviPress, you can't use QuickSite to manage an existing Web site unless you're patient enough to import it one page at a time. It's a fast way to create and maintain a Web site, but QuickSite doesn't offer professional Web developers powerful features. And though QuickSite is generally easy to use, Web beginners will want a better HTML editing tool than the one it provides.

DeltaPoint QuickSite 1.0. List price: $99.95. Requires: 8MB RAM, 3MB hard disk space, Microsoft Windows 3.1 or later. DeltaPoint Inc., Monterey, CA. *(No Indian partner.)*

HTML EDITORS

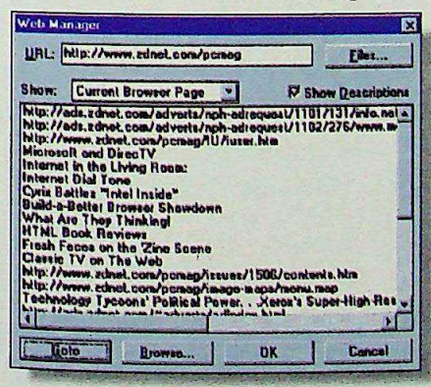
Spider 1.1 Makes Web Masters

By Angela Hickman

InContext Corp.'s $99 Spider Version 1.1 is a feature-rich and powerful HTML editor that allows World Wide Web authors to create sophisticated pages without a thorough knowledge of Hypertext Markup Language. Version 1.1 supports the latest HTML standards, as well as Netscape and Microsoft extensions. The trade-off for this power is the program's complexity.

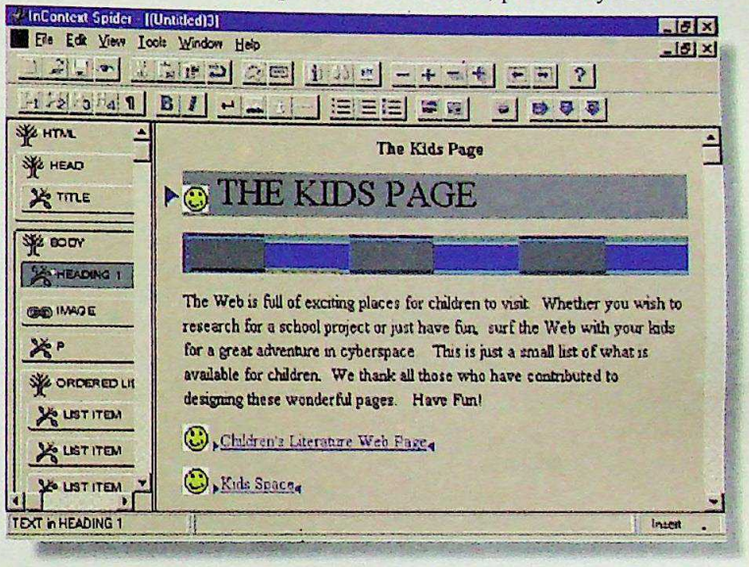
The first thing you'll notice about Spider is that its main window looks like that of a word processor. The main window is divided into a Logical Editor and a Content Editor. The Logical Editor, a vertical pane on the left side of the screen, is a row of buttons that represents the different elements on the active Web page. The Logical Editor is especially useful for navigating complex or lengthy Web pages. You create and edit Web pages in the Content Editor. Entering and formatting text is almost as easy as in a word processor.

Most of the program's functions are accessible from the top menu, which has buttons for creating headings, forms, and lists, inserting images and hyperlinks, and previewing your work. You'll need to rely on the button bubble help (which is new to this version) to figure out what each button does, because the buttons are small and the interface feels somewhat cluttered.



WEB CENTRAL: *Spider's Web Manager makes it easy to add links to other Web sites from your pages.*

You can create Web pages from scratch, but Spider also provides 28 templates to get you started. In addition to templates for plain HTML 2.0 and 3.0 pages, there are ones for corporate intranet sites, press releases, résumés, and personal pages for children and adults.



CHEAT SHEET: *InContext Spider's built-in templates will have you or your company up on the Web in no time.*

Version 1.1 also supports the Windows Clipboard and offers an import feature that will check your HTML for any errors.

Creating a new HTML file is nearly identical to creating a new file in a word processor: Just pull down the File menu and click on the New option. Once you select a template, Spider displays an empty document in which you can add text and drag and drop .GIF and JPEG images, as well as sophisticated HTML 2.0 and 3.0 features such as tables and blinking text.

New to this version is support for both Netscape Navigator and Microsoft Internet Explorer extensions, such as wraparound text and background sound, respectively.

InContext has also improved integration with Navigator. Although Spider comes with the Spyglass Enhanced Mosaic browser, with a few changes to your ICSPIDER.INI file you can also use Navigator to find useful elements on the Web and, after incorporating them with the Spider editor, preview your work. (As of this writing, the beta version of Navigator 2.0 Gold was not fully supported.) InContext plans to release a definition file by the time you read this; it will allow users to edit Java applications within the Spider editor, though users won't be able to preview them.

One of Spider's most interesting features is its Web Manager. It allows users to insert links from a Web page, download a page from a browser, or jump to a Web page that they want to view.

You can download a trial version of Spider from InContext's Web site at *http://www.incontext.com*. A CD-ROM version, which includes additional utilities, is also available.

InContext Spider Version 1.1. List price: $99. Requires: 4MB RAM (8MB recommended), 12MB hard disk space, Microsoft Windows 3.1 or Windows 95. InContext Corp., Toronto, Ontario, Canada.

(No Indian partner.)

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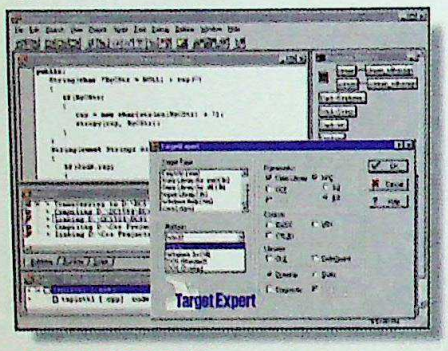
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PROGRAMMING

Borland's 32-Bit C++ Suite Boasts Powerful New Tools

By Richard Dragan

Borland's $499 C++ Development Suite 5.0 is a significant upgrade of an already strong C++ compiler, as well as an appealing combination of programming tools. For good measure, Borland throws in advanced C++ language features and Java support (see the sidebar "Borland Jumps on the Java Bandwagon"), making the package a bargain.



PROGRAMMER'S PICK: *TargetExpert builds applications for a range of platforms.*

With Version 5.0, Borland has preserved the basic design of its C++ Integrated Development Environment (IDE) but has added important new features. The new IDE is now a true 32-bit tool that takes full advantage of the Windows 95 interface and long filenames. Small bitmaps, called *glyphs,* are used to provide visual clues to the output messages in the compiler, and the toolbar is now detachable and dockable. Another welcome addition is the ability to build projects in the background while you do other work.

This IDE offers integrated 32-bit multithreaded debugging, complete with disassembly. You can now edit resources such as bitmaps and dialog boxes without leaving the IDE. Significantly, the TargetExpert lets you build programs for a broad range of platforms in use today: DOS, 16- and 32-bit Windows, and Java.

Under the hood, the new Borland IDE uses ObjectScripting to expose all the environment's functionality. It's possible to customize the IDE by writing code yourself using cScript, an object-oriented language based on C++ with hundreds of functions to choose from. You can add your own syntax-highlighting scheme to code or even create custom tools.

The updated C++ compiler offers support for the latest C++ language features, including namespaces and emerging ANSI/ISO C++ keywords such as *Boolean* and *mutable.* Borland's suite includes the ANSI/ISO Standard C++ Library, licensed from Rogue Wave Software, which supports the Standard Template Library and other ANSI/ISO-sanctioned classes such as strings. A separate 32-bit compiler from Intel Corp. provides support for optimizing Pentium and Pentium Pro code.

Other advances include the new ObjectWindows Library (OWL) 5.0, which offers powerful C++ classes for accessing Windows 95 features such as common controls, threads, sockets, and e-mail. Even when working with 16-bit applications, OWL 5.0 emulates the advanced 32-bit Windows 95 common controls and allows the use of .OCX and .VBX controls in both 16-bit and 32-bit Windows programs. In a nod to Microsoft Foundation Classes (MFC), Borland C++ 5.0 supports building MFC projects. The new IDE still requires the use of an AppExpert to automate or browse classes during development. You won't find the ability to browse general C++ classes before you build a project, a feature found in other compilers.

Borland Development Suite 5.0 includes many extras, such as CodeGuard 32/16, which allows you to do bounds-checking and track down memory leaks as you test code. CodeGuard will do a variety of API and resource checks, log errors if it finds the... and point you to the offend... lines of code. When you're re... to ship an application, you'll ap... preciate InstallShield Expr... the installer program fr... InstallShield Corp. that genera... install and uninstall progra... from wizard-based forms. Fin... the suite ships with a copy ... InterSolv's control packa... PCVS Version Manager.

Borland has taken advanta... of C++ 5.0's CD-ROM packa... ing by integrating these bund... tools fully into experts, men... and toolbars. With its combi... tion of licensed developer to... and support for the latest fe... tures of C++ and Java, Borla... C++ Development Suite 5.0 i... good value and merits seri... consideration.

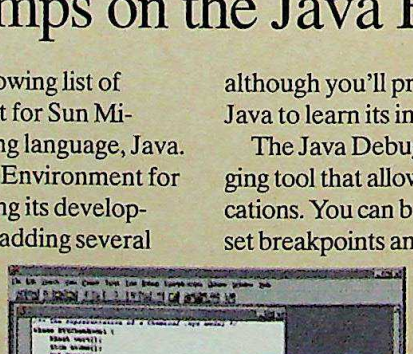
Borland C++ Development Suite 5...
List price: $499; upgrade, $34...
Requires: 16MB RAM, 100M... hard disk space, Microsoft W... dows 95 or Windows NT 3.51. B... land International Inc., Scotts V... ley, CA.

(Indian partners Datapro Infowo... Pune; Wipro, Bangalore.)

Borland Jumps on the Java Bandwagon

Borland has joined the growing list of vendors offering support for Sun Microsystems' programming language, Java. Borland's C++ Add-On Environment for Java goes a step beyond porting its development environment to Java by adding several powerful features that will better enable developers to begin writing Internet-ready applications.

The Borland AppExpert includes a Java target option. You can select from a variety of settings here using a tabbed dialog interface. This tool generates a default working Java project, including an HTML document, which can then be used to launch your applet.



JAVA-READY: *Borland has fully integrated Java into its C++ environment.*

Full syntax highlighting is included for Java keywords within Borland C++ 5.0. A toggle switch lets you switch between Java and regular C++ syntax highlighting. Borland has provided integrated online help for Java development, although you'll probably still want a book on Java to learn its ins and outs.

The Java Debugger is a full-featured debugging tool that allows you to test your Java applications. You can browse methods in your classes, set breakpoints and watches, and control multiple threads. Instead of running as interpreted code, which is the default for Java, AppAccelerator uses the strategy of "just-in-time" compilation. This means that a Java application can be compiled and saved before it's executed. By avoiding the sluggishness of "interpreted" code, Java applications get a real performance boost.

This bodes well for Borland's plans for Java support. A second Java product (code-named Latté) is in the works and promises to bring a RAD tool approach to writing Internet applications, using Java as its core. But thanks to Borland C++ Development Suite 5.0, you don't have to wait for Latté to get a taste of Java.—*RD*

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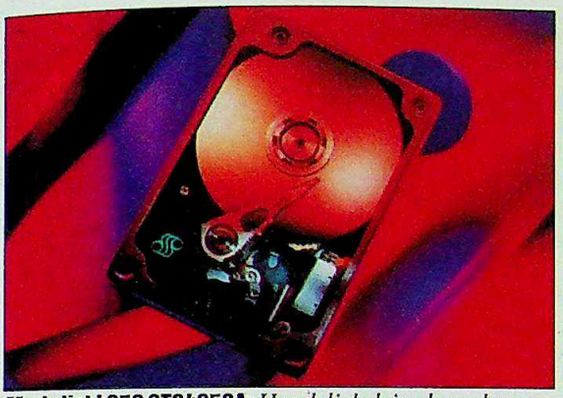
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HARD DISK DRIVE

Seagate Expands Medalist/Marathon Disk Drive Families

The new Marathon and Medalist drives are Seagate's first Fast ATA-2 volume products to use Magneto-Resistive (MR) heads and Partial Response-Maximum Likelihood (PRML) read channel technology. Medalist 4250 (ST34250A) provides an unprecedented 4.2 GB of storage in a 3.5-inch, low profile design, with a rotational speed of 5,400-rpm and an average seek time of 10.5 msec. Fast internal data transfer rates of up to 87 Mbits/second make the Medalist 4250 series the perfect complement to data-intensive applications like multimedia and the Internet.

Seagate is also introducing two other drives in the Medalist 4250 product family with leading levels of capacity and performance: the 3.4 GB Medalist 3440 (ST33440A), and the 2.5 GB Medalist 2530 (ST32530A). Each model features Self-Monitoring Analysis and Reporting Technology (SMART), and comes with a standard three year limited warranty.



Medalist 4250 ST34250A: *Hard disk drive based on PRML read channel technology.*

Extending its Marathon family of small factor 2.5-inch drives designed specifically for premium, speciality, notebook, and ultra-portable computers, Seagate has announced two new models: the 2250 and 1350sl.

The Marathon 2250 (ST92255 AG) is a 2.25 GB drive with a Z-height of 17 mm. It has a rotational speed of 4,500-rpm with a quick seek time of 14 msec, enabling the performance necessary for multimedia, database, and other storage-intensive notebook applications. For ultra-portable designs, the Marathon 1350sl (ST91350 AG) provides 1.35 GB of capacity in a 12.7 mm Z-height package. Evolved from a common design, both the 2250 and 1350sl feature industry-leading capacities in their respective form factors.

The excellent power-to-performance ratio of the Marathon 2250 and 1350sl was achieved by Seagate's innovative design in components such as spindle motors and actuator assemblies. Both products feature Seagate's patented SafeRite technology, significantly boosting operating shock protection and ensuring data integrity by preventing overwrite to adjacent data tracks through shock or vibration. Additional innovations in data reliability, including SMART and 100% on-the-fly Error Correction Code (ECC), provide users with the utmost reliability in demanding mobile computing environments. Seagate's new Marathon 2250, Marathon 1350sl and Medalist 4250 family of disc drives are scheduled for volume production in the second calendar quarter of 1996.

Seagate Technology is a data technology company that provides products for storing, managing, and accessing digital information on the world's computer and data communications systems. Seagate is the largest independent disk drive and related components company in the world.

Medalist/Marathon. *Seagate Technology International, #08-21 Seagate Building, 202 Kallang Bahru, Singapore 1233. Tel: 2903954; Fax: 2995065.*

RAD TOOL

Powersoft Launches Optima++ for Client/Server Application Development

US-based Powersoft has announced Powersoft Optima++, a rapid application development (RAD) tool that will enable a broader range of developers to use the powerful C++ language for building client/server and Internet applications. Optima++ will be a significant addition to the Powersoft product family that will leverage proven and successful technology from PowerBuilder, Watcom C/C++, and Sybase SQL Anywhere. Optima++ will address the increasing demand for high-performance, component-based application development tools and will enable developers to create powerful and efficient C++ applications without a steep learning curve. The Optima++ product line will be offered in a number of editions, with the first to ship within the next three months.

Powersoft Optima++ is based on a component-centric architecture that will allow developers to leverage OLE and native component technology to quickly build custom applications. The innovative drag-and-drop programming approach will enable developers to "walk up and use" Optima++ to create state-of-the-art, native 32-bit C++ applications that exploit the new user interface controls and operating system features of Windows 95 and Windows NT. Applications can be deployed as a single EXE file or with DLLs. In addition to 32-bit Windows environments, applications will operate on Windows 3.1 using Microsoft's Win32s.

Based on industry-leading Watcom C/C++ compiler technology, Optima++ will deliver native 32-bit executables with highly optimized code. For client/server application development, Optima++ will include both data-aware bound controls and proven PowerBuilder technology, including the DataWindow, DataPipeline and InfoMaker. As a key part of the Sybase web.works architecture for the development and deployment of business applications on the Internet, Optima++ will enable users to develop Internet client/server applications, as well as Sun Java applets, Microsoft OLE sweeper controls, and Netscape browser plug-ins.

Powersoft Optima++ will make C++ power more accessible to business developers. Using wizards and drag-and-drop programming techniques, developers unfamiliar with C++ will be able to learn to program in this object-oriented language. Experienced C++ developers will find Optima++ dramatically increases their productivity. Optima++ developers will be able to quickly create applications by painting forms and directly connecting code to user interface controls.

Optima++ is designed to fully exploit the Windows 95 user interface, OLE automation and OLE controls. OLE controls from any vendor will be automatically integrated, enabling developers to immediately access their capabilities with drag-and-drop programming, dynamically generated wizards, and on-line reference information. In addition, Optima++ will employ background builds and advanced incremental linking to provide a responsive development environment.

Optima++ developers will have access to the comprehensive range of service and support programs offered worldwide by Sybase and its Powersoft division. Optima++ users will also have access to the dynamic industry of vendors that support Powersoft products.

Optima++. *NIIT, C125 Okhla Phase I, New Delhi 110020. Tel: 6817341; Fax: 6817344.*

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BAR CODE SCANNER

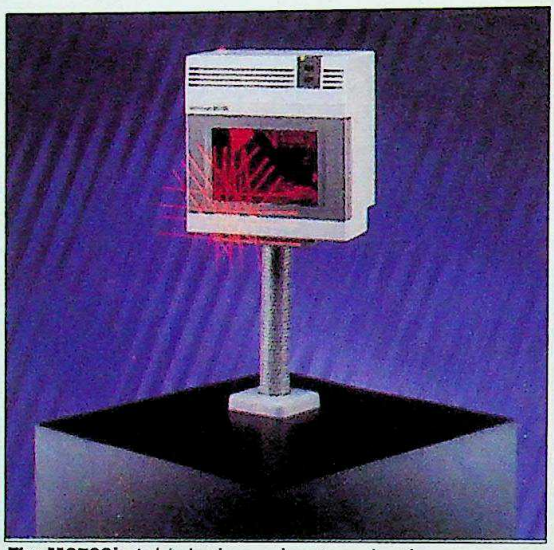
Ideal for Retail/Industrial Applications

New Delhi-based Basawa Technologies has launched Metrologic laser bar code scanners for retail and industrial applications. These have in-built decoders and can be interfaced with a PC using either RS232C, keyboard wedge, OCIA, or light pen emulation.

The scanners are supplied as a complete kit with cables, a stand, and a transformer. The models available include the Metrologic MS951, a hand-held scanner, and Metrologic MS700i, an omni-directional scanner that reads up to a seven inch depth at 2,000 lines/second.

The MS900 Series of Hand-held laser scanner incorporates a patented design and triggerless operation for a variety of scanning applications. These and other features make the MS900 Series comfortable, lightweight, and easy to use.

While the patented design allows for maximum operator comfort and flexibility, the triggerless operation offers two main advantages—the scanner requires less hand movement to operate, and the scanner can also be used for hands-free scanning in the stand.



The MS700i: *A high-throughput projection scanner.*

A new feature of the MS951 is a choice of programming methods—through the MS951 programming guide, or through Hand Set, an IBM-compatible software program.

Engineered with an IR sensor that controls on/off operations, the MS900 is fully automatic. With its solid state design and durable construction, the scanner can withstand the shock of five-foot drops onto an asphalt-covered concrete floor.

The MS900 Series offers two designs: the MS951 and the MH941. The MS951 has onboard decoding for versatile POS applications, while the MH941 interfaces directly into decode-equipped "keyboard wedges," controllers, or the MC941 decoder.

The MS700i is a high-throughput projection scanner incorporating the latest in VLD (visible laser diode) ASIC/VLSI and surface mount technologies. The MS700i consumes only 8 watts of power and can be directly connected to many host systems. It is capable of supporting a scanning device. Other features include a sleep mode that turns the laser and motor off when not in use. A new feature of the MS9[illegible] is a choice of programming methods—through the ScanSet programming guide, or through ScanSet, an IBM-compatible software program.

Another new feature is a volume control card. By simply scanning the card, the scanner's beeper volume can be raised or lowered.

With a scan speed of 2[illegible] lines per second, the MS[illegible] aggressively scans poorly printed bar codes and reads tombstone UPC, EAN and JAN codes immediately on the first pass at any roll angle. In addition, the scanner's omni-directional mounting capability adapt to any size or space requirements. Scanning capabilities at this level make the MS[illegible] an ideal laser bar code scanner for a multitude of applications.

MS951, MH941, MS7[illegible] *Basawa Technology, 5 S[illegible] Priya Vihar Market, New D[illegible] 110016. Tel: 6865599; F[illegible] 6969977.*

CONNECTIVITY SUITE

Novell Announces LAN WorkPlace Pro for Windows 95 and Windows NT

California-based Novell has announced a new version of its integrated TCP/IP applications suite for the Internet and intranets. It can be used to integrate corporate intranets and the Internet into existing NetWare networks. The new version extends the reach of the suite to Windows 95 and Windows NT. LAN WorkPlace Pro applications run in 32-bit protected mode, which means the product can take advantage of the increased stability and power of the Windows 95 and Windows NT environments. The suite uses the TCP/IP stack and dialer included in the two operating systems, and has several other features ranging from improved Internet access to simplified installation and administration.

Users can gain immediate access to World-Wide Web (WWW) sites, mail servers, and news groups. LAN WorkPlace Pro includes version 2.01 of the Netscape Navigator Internet client, the latest version of the industry leading Web browser that supports new Internet technologies including Java, JavaScript, and Inline plug-ins. The enhanced mailer in the suite includes automatic viewing and support for Multipurpose Internet Mail Extension (MIME) attachments, providing improved document transmission and compatibility. The suite has terminal emulators including Telnet Presenter, TN3270, TN5250, and VT420, which give users enterprise connectivity to IBM, DEC, and Unix-based workstations, servers, and mainframes.

With the help of X-Server, users can access remote X-Windows applications and files on Unix systems. The X-Server enables users to run X applications and Windows programs on the same PC. It supports the latest X11R6 standards and is X/Open certified, assuring compatibility with future as well as present X applications.

LAN WorkPlace Pro integrates and extends the features of Novell's LAN WorkPlace 5 and LAN WorkGroup 5 products, thereby providing centralized installation, workstation configuration, and maintenance. A Dynamic Host Configuration Protocol (DHCP) assigns IP addresses centrally. The suite also has a vastly simplified installation program and network tools like finger, finger daemon, ping, and remote shell, to extend the power of 32-bit network computing to standard network utilities. DOS and Windows 3.1 versions of LAN WorkPlace Pro are also available.

LAN WorkPlace Pro will be available in India through authorized Onward Novell channel partners from July 1996 onwards.

Novell operates in India through Bombay-based Onward Novell, a joint venture between Novell and Onward Technologies.

LAN WorkPlace Pro. *Onward Novell Software Inda. Mar[illegible] Bhavan, Saki Vihar Ro[illegible] Bombay, 400072. Tel: 8351[illegible] Fax: 8214203.*

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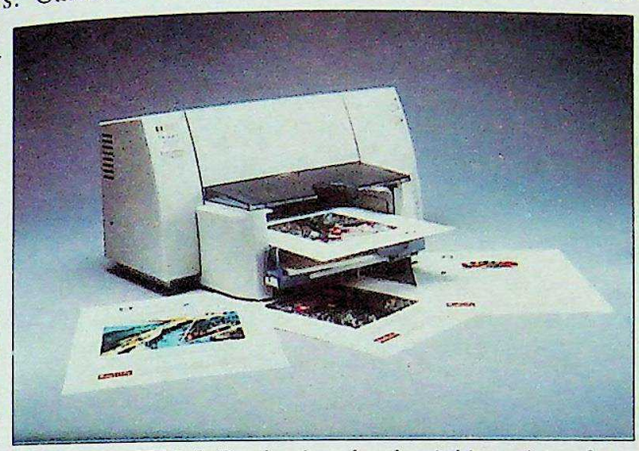
INKJET PRINTER

HP Introduces Color Deskjet Printer for SOHO Segment

US-based Hewlett-Packard Company (HP) has introduced a new color inkjet printer for small office home office (SOHO) consumers. Called DeskJet 820Cxi, the Professional Series inkjet printer is customized exclusively for Windows users, and incorporates HP's deskjet printing performance architecture (PPA).

The new printer costs Rs 26,000 and offers professional quality printing. PPA is a comprehensive new printing technology that creates efficiencies between the host PC and printer resources to improve printer performance.

HP DeskJet 820Cxi uses a Windows-optimized version of the new architecture that works by offloading printer formatting tasks to the host PC. A single integrated circuit handles the printer mechanics and input/output operations. Data flows directly to the printhead from the host PC, improving print speed performance. DeskJet 820C printers can print up to 6.5 pages per minute (ppm) in black text, and 4 ppm in color. The printer can handle a wide range of sizes and stocks, making them ideal for small business and home office printing needs. In addition to letter, legal, and custom paper sizes, the printer supports labels, envelopes, and transparencies.



HP DeskJet 820Cxi: *Professional color inkjet printer for the SOHO market.*

Additional features include an envelope feeder that allows the user to print envelopes one at a time, and support for manual duplex printing. The duplex function can be used to print on both sides of a page, without bothering about page numbers. The printer also offers 50 TrueType fonts, allowing users to create a wide variety of document styles, from everyday reports and correspondence to direct mail pieces and custom invitations or cards. DOS printing is supported through Windows.

HP DeskJet 820Cxi uses HP's new Professional Series product line targeting business printing, that makes heavy demand on quality and speed. It also uses HP's RealLife imaging system, which includes HP's ColorSmart for automatic adjustment and optimal color setting. The printer has earned the US Environmental Protection Agency's Energy Star designation for low power consumption, using up to 80% less energy than dot matrix printers.

HP DeskJet 820Cxi. *Hewlett-Packard India, Paharpur Business Center, 21 Nehru Place, New Delhi 110019. Tel: 6472311; Fax: 6461117.*

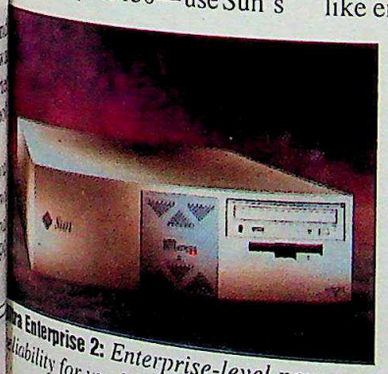
BUSINESS SERVER

Sun Launches High-End Business Servers for the Workgroup Environment

US-based Sun Microsystems, a leader in networking, workstations, and servers, has unveiled two new servers that deliver enterprise-level power, reliability, and expandability to workgroup environments. The servers—Ultra Enterprise 2 and Ultra Enterprise 150—use Sun's 64-bit UltraSPARC processor, integrating 64-bit processing, 64-bit I/O, and 100 MB per second Ethernet directly on to the main processing board.

Ultra Enterprise 150 is designed to ensure system reliability and uptime through features like error correction code, memory, and hot pluggable disks, which allow failed drives to be replaced while the system is up and running.

The server also supports hot sparing for increased reliability, and RAID 0, 1, and 5 for data redundancy and protection.



Ultra Enterprise 2: *Enterprise-level power and reliability for workgroup environments.*

Ultra Enterprise 150 comes standard with one 167 MHz processor, a 512 KB cache, 12 hot pluggable disk bays, 2.1 GB system disk, CD-ROM and floppy drives, 100BASE-T, and a Fast/Wide SCSI controller.

Ultra Enterprise 2 has one or two 167 MHz or 200 MHz processors, 512 KB cache or 1 MB external cache per CPU, up to 2 GB of memory, Fast/Wide SCSI, 100BASE-T, and CD-ROM. It can be upgraded to next generation UltraSPARC processors as and when they become available. It supports up to 1 TB of disk storage using Sun's SPARC-storage arrays.

The new Enterprise servers are ideal as middle-tier platforms in a three-tier client/server environment that connects PCs, PC LAN servers, and workstations to enterprise systems.

The systems inter-operate seamlessly in any client environment, and can consolidate the functions of multiple PC LAN servers to simplify administration and cut costs.

Both servers feature 100% binary compatibility allowing all Solaris 2 applications to run unchanged. Ultra Enterprise 150 and Ultra Enterprise 2 are conceived as members of a business server range that offers enhanced performance, reliability, and scalability.

The servers are ideal for database management, Web service, Internet commerce, and workflow/communications applications. They support popular workgroup database applications including Informix-Online Workgroup Server, IBM DB2 2.0, Oracle Workgroup Server, and Sybase SQL Server II.



Ultra Enterprise 150: *Designed to ensure system reliability and uptime.*

Ultra Enterprise 150 and Ultra Enterprise 2. *Sun Microsystems Intercontinental Operations, India Liaison Office, 11th Floor, Du Parc Trinity, 17 M.G. Road, Bangalore 560001. Tel: 5599595; Fax: 5599598.*

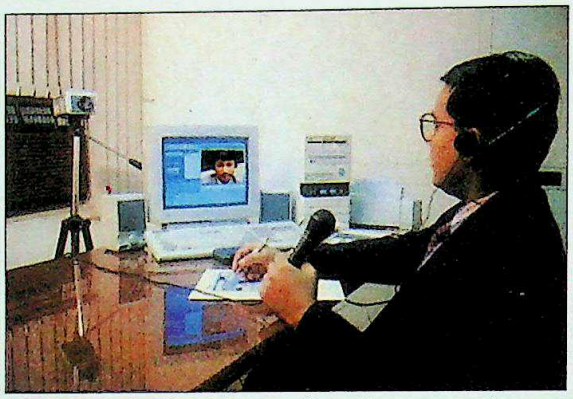
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VIDEOCONFERENCING SYSTEM

Windows System That Supports Video Calls over Analog Telephone Lines

Calcutta-based Lee & Nee Software Exports has introduced VidNet, a video conferencing system with a number of unique features. A caller can actually see the person at the destination end of the telephone line. This feature is based on a Windows-based software program in which video calls are made over analog telephone lines, LAN/WAN, the Internet, and over a separate modem line to a similarly equipped location.



VidNet: *Versatile video conferencing system for the small enterprise.*

VidNet allows participants to enter a group workspace merely by calling or being called by any one currently participating in the video conferencing session. Multiple, multipoint conferences can take place simultaneously over the network. To see others, video capture equipment is not essential. However, for others to see you, you must be equipped with a video capture board and video camera.

Many callers can view the video transmission of one caller on the network. Two-way video editing is obtained when each is equipped with video capture equipment. The voice portion is handled as normal over separate existing voice lines.

VidNet provides quick and efficient ways to communicate effectively through face-to-face meetings. It enables observation of facial expressions, hearing of voices, usage of blackboards, charts and other media to draw pictures, take notes, point to things.

Even vital decision-making and discussions can be made, approvals of documents can be obtained on the conferencing system with one or more participants. It simulates the advantages of face-to-face meetings without the obvious problems faced in actually doing so,

VidNet can act as a mobile system if a compatible laptop and cellular phone is used. With the help of a mobile phone and multimedia kit, the system can act as an independent office.

VidNet. *Lee & Nee Software Exports, 14B Camac Street, Calcutta 700017. Tel: 2405[illegible] Fax: 2477359.*

NETWORK ADMINISTRATION UTILITIES

Sonata Launches Symantec's Norton Administrator Suite

Bangalore-based Sonata Software, the authorized distributor for the entire Symantec range of products in India, has announced the availability of Norton Administrator Suite—Essential Edition from Symantec.

Norton Administrator Suite—Essential Edition integrates a wide array of features, including hardware and software inventory, software metering and distribution, desktop virus protection, desktop configuration management, and remote control—essential features for the network administrator in the day-to-day management of the network. Each of the suite's components is the market and technology leader in its category, proven on more than 10 million desktops worldwide.

Norton Administrator Suite—Essential Edition is based on Symantec's Norton Enterprise Framework, an architecture for providing integrated, platform-independent, centralized network administration solutions. Because of this approach, network administrators can actively manage network events. For example, administrators can use *Distribution* to install common desktop configurations and software, and then use *Inventory* to decide which machines get which configurations and software.

Norton Administrator Suite—Essential Edition provides a single, integrated installation for all components. LAN administrators can then access a single Windows console (running on Windows 3.x, Windows 95, or Windows NT) for all applications. The product is very easy to setup and use, providing common user interface elements and a common application database for various components such as inventory and metering. Tight integration across all components makes it easy to address common problems. For example, LAN administrators can use *Inventory* to find machines that don't have anti-virus software installed and then use *Distribution* to install anti-virus software and virus definition updates.

Norton Administrator Suite—Essential Edition provides hardware inventory data on more than 300 fields of detailed information. The hardware inventory component supports the Desktop Management Interface (DMI), and can collect available information, such as serial number, system name, and primary user information, from a PC's management information file (MIF). The product's software inventory component recognizes more than 5,100 applications, including 32-bit programs, and allows LAN administrators to track system files and edit the application database. Administrators can also collect network information and IP addresses under Windows.

The product's *Software Distribution* component delivers, installs, and updates files and software automatically, and lets administrators edit the registry, text, and .INI files. Administrators can customize distributions and receive detailed error logging reports. Norton Administrator Suite—Essential Edition also supports Novell's NetWare Directory Services (NDS), which allow administrators to distribute software to existing NDS user and group levels, in addition to including NT Server Domain support.

Norton Administrator Suite—Essential Edition allows either permissive or restrictive license metering of applications on the server or workstation. Administrators can also meter predefined suites or define custom application suites to meter. Metering of native Windows applications is also supported.

With the *Desktop Configuration Management* component, administrators can control user access to data and applications. In addition, administrators can simplify and customize user interfaces and user access to desktop and network resources. Desktop configurations can be designed to augment or replace the user interface component of complex environments, such as Windows 95. Administrators can also use the component to establish a standard user interface that will aid in the migration from Windows 3.1 to Windows 95. This can keep novice users out of trouble and speed access to computer resources for novice and experienced users alike.

With a built-in scanner, administrators can search multiple network servers for applications to be included in desktop configurations. These scanned applications reside in a central database for easy access and review in assigned additional configurations.

Norton Administrator Suite Essential Edition. *Sonata Software, 1st Floor, APS Trust Building, Bull Temple Road, NR Colony, Bangalore 560019. Tel: 6610330; Fax: 6610972.*

PHOTOGRAPH BY ANDY FREEBERG

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MICHAEL J. MILLER

The Three-Piece PC

Remember that first desktop PC you bought? If it was "IBM-compatible," it almost certainly looked a lot like the original IBM PC, introduced 15 years ago. It had three major components: a keyboard, a monitor, and "the system" itself—a box containing the motherboard, drives, and expansion slots.

Now take a look at the home computers. They still look pretty much the same. So, in fact, does just about any desktop computer. Yes, the processors have gotten much faster, the drives hold more data, the expansion slots do a lot more, and the traditional desktop case has been replaced by a smaller box or a minitower. But it's still the same three pieces: monitor, keyboard, and computer. OK, now we've added a mouse. Big deal. True, a few of the newest products look a bit nicer. The Acer Aspire, for example, boasts designer colors and sleek curves. It's nice to look at, but underneath it all, it's still just a pretty face on the same basic idea.

It doesn't have to be that way. Just look at the evolution of the portable computer, which, 15 years ago, was the size of a sewing machine and had to be plugged in. That early model was replaced first by a lunch box–sized machine and later by the now-familiar notebook with its clam shell design. And we've seen a variety of personal devices (such as PDAs) of all shapes and sizes.

Desktop PCs should change too. And they will. In fact, the first personal computers did look different from the current three-piece arrangement. The Radio Shack Model 1 that I bought 19 years ago was an all-in-one design that looked more like a typewriter with a screen. The Apple II and the Commodore 64 combined the CPU and keyboard. Later, the Macintosh popularized the monoputer, a combined monitor and CPU with external keyboard—a design still popular in other parts of the world. But in the U.S., the desktop PC still looks the same. Admittedly, the three-piece design is comfortable and flexible, and it has worked well for us. Still, there has to be a better way, particularly for the computer at home. And it looks like we're about to see it.

The most obvious example is the new Gateway Destination series, which is designed for a living room. It includes a 31-inch monitor that also displays television signals, and it works with a wireless keyboard and remote control device. The Destination series looks more like high-end A/V equipment than a computer. I'm still a bit skeptical because I haven't used a shipping unit yet, but the concept is appealing.



PHOTOGRAPH BY ANDY FREEBERG

BREAK THE MOLD

The three-piece design has worked well. Still, there has to be a better way, particularly at home.

More changes are taking place with the input devices we use. Compaq and Fisher-Price are designing input devices for kids that look more like steering wheels or giant trackballs. Someday, someone is going to integrate such devices into home PCs. Already, Compaq has a combination scanner/keyboard, and HP is integrating a photo scanner in some models. Another area of innovation is in the designs for so-called Internet terminals from companies such as Japan's Bandai, Oracle, and Sun. These tend to be much smaller than PCs and look like cable set-top boxes.

Home PCs are ripe for change. I can envision a smaller, less obtrusive PC in the kitchen serving as a family scheduler, phone book, and intelligent answering machine. But it will have to be a lot cheaper and easier to use than a typical PC.

In the future, we will all have multiple computers at home. Some will perform traditional computing tasks, while others will be used mainly for games, communications, controlling other devices in our homes, and other purposes. It's quite likely that all these PCs will be tied together somehow, perhaps using wireless technology, something like Novell's embedded systems approach, or a more traditional networking approach. The era of the home hub may be coming, but we know one thing: The technology has to be far simpler, maintenance-free, and nearly invisible to typical users.

Actually, depending on how you look at it, most of us already do have multiple specialized computers at home already. Computers control most of the electronics in our homes and cars. Just recently, the computer in our oven crashed and the motherboard had to be replaced. It kind of makes you wonder. But, in general, the expansion of computers into everyday life is a good thing. Although, to be successful, PCs must fit better into our homes.

To achieve this, the three-piece design eventually may go the way of the three-piece suit. It was fashionable once, and it may even remain popular in some offices, but you wouldn't really want to wear one at home. □

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THE ULTIMATE U

WORK BETTER AND SMARTER BY OUTFITTING YOUR WIT

Software utilities are a lot like all the tools hanging in your garage. Each one has a very specific purpose, and even though a tool may sit unused for weeks or months at a time, you're awfully glad it's there when you need it.

In this 14-part cover story, we evaluate utilities—or tools—that help make your computing life easier. Do you want to change the look of your desktop? Maximize your memory? Uninstall old applications cleanly? Protect your system from viruses? Run regular backups? Diagnose hardware problems? No matter how many bells and whistles Microsoft continues to add to its operating systems—and Windows 95 has plenty—there's always room for improvement. We focus here primarily on commer

By Lance Ulanoff

THE BASICS



Windows 95 includes its own new utilities, the Plus! Pak adds more, and Norton Utilities satisfies many needs. Is that all the utility power you need? **Page 34.**

DESKTOP ENHANCERS



No one interface can be right for everyone. Fortunately, it's easy to change the way Windows 95 looks and behaves if you add one of these eight interface makeovers to your desktop. **Page 42.**

UNINSTALLERS



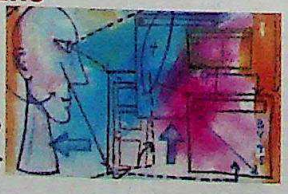
Windows apps spread themselves out all over your hard disk. It takes the talents of an uninstaller to remove them cleanly, completely, and safely. We test the three competitors. **Page 55.**

ANTIVIRUS UTILITIES



Whether you work alone or in a group, protecting yourself against viruses is a good idea. We put virus catchers through tests on standalone PCs and on LAN-based systems. **Page 60.**

FILE VIEWERS



You'll work faster if you don't have to spend lots of time opening up specific apps just to look at specific files. A universal file viewer is just about the handiest utility you can have. **Page 70.**

MEMORY UTILITIES



Does Windows 95 render traditional memory managers obsolete? Not necessarily. Vendors are pulling new tricks out of their sleeves. PC Labs tests their effectiveness. **Page 74.**

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UTILITY GUIDE

WITH SOME OF THESE 170 PROBLEM-SOLVING TOOLS.

DIAGNOSTIC UTILITIES



Take a knowledgeable peek inside your PC without turning a single screw. These five utilities alert you to problems you may be having with your hardware and offer good advice. **Page 79.**

OS/2 UTILITIES



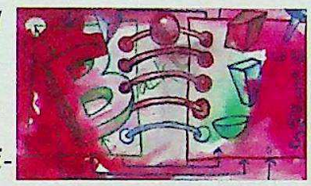
Users of OS/2 Warp have their own grab bag of utilities. We test 30 desktop enhancers, uninstallers, antivirus utilities, memory managers, disk utilities, and backup tools. **Page 93.**

INTERNET PLUG-INS AND HELPERS



The way to keep your Web browser up-to-date is to accessorize it with all the latest Internet bells and whistles. Here's our Web experts' list of essential add-ons. **Page 105.**

BACKUP UTILITIES



As you add utilities to equip your PC for optimal use, don't forget about backup. PC Labs tests four NetWare-based backup utilities that help keep your data safe. **Page 84.**

INTERNET ORGANIZERS



Something as big and chaotic as the Internet needs to be tamed. These six organizers and trackers handle the job of keeping all of your online activities in line. **Page 96.**

MORE INTERNET UTILITIES



From cybernannies that childproof the Web to connect-time clocks, file downloaders, and e-mail clients, these 20 diverse utilities help you maximize your Internet experience. **Page 107.**

MORE ESSENTIAL PROBLEM SOLVERS



Compress files, save your screen, balance colors, and tie apps together. Our experts have found 11 great utilities that tackle pesky little productivity problems. **Page 89.**

INTERNET SEARCH TOOLS



Here's a way to save money when you explore the Internet: Do your searching offline. We test ten products that provide Web indexes with which you can explore the Web. **Page 101.**

JOIN US ONLINE

From April 22 to 26, *visit PC MagNet on CompuServe to discuss uninstaller utilities with contributing editor Edward Mendelson and vendor representatives (GO EDITOR).*

On the Web, *visit www.pcmag.com for a discussion of the latest trends in antivirus software.*

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cial (no shareware), Windows 95–specific utilities, but we've also included a section on OS/2 utilities.

There are other utility categories that warrant coverage, but most lacked enough commercial competitors to merit comparative reviews. We discuss some of the more useful ones in our "More Essential Tools" section.

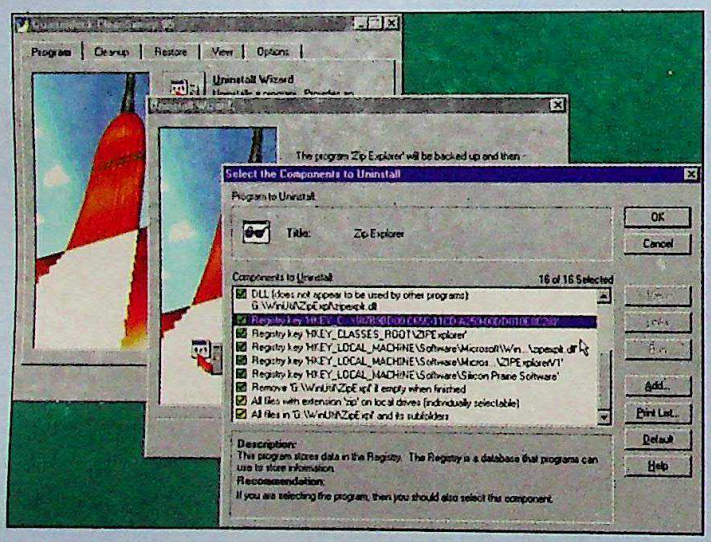
START WITH THE BASICS

It's common knowledge that underneath Windows 95's pretty face is DOS 7.0. Windows 95 still features some of your favorite utilities, but others have been removed. As a result, we think it's a good idea to start out with a good utility toolkit, like Norton Utilities and Windows 95's own enhancement, the Windows 95 Plus! Pak. For more details, see the section "The Basics." You'll also notice that in our sidebar "What Makes a Great Utility?" we offer some highlights from the 100-plus utilities we examined. Though you may not need all of these utilities, this should serve as a helpful guide when you make your buying decisions.

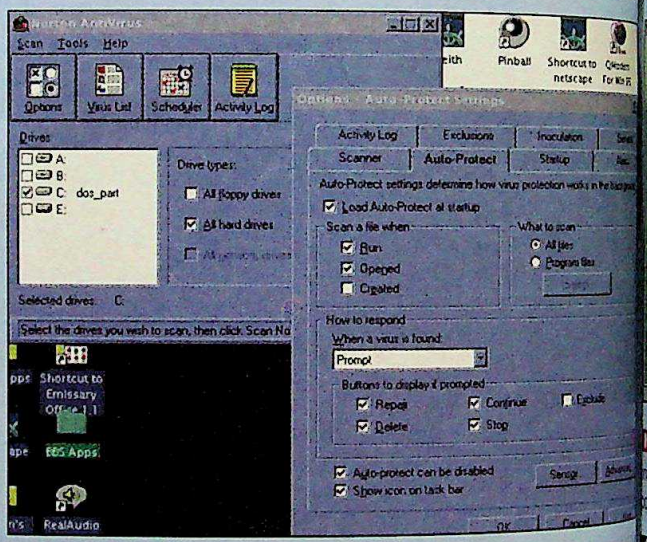
This year, we're also witnessing an explosive growth in Internet utilities. It's a display of energy and creativity, the likes of which we haven't seen since the first days of the PC. All of a sudden there are hundreds of products to help you take advantage of the Internet's many facets. We've broken them down into three main categories: organizers, search tools, and plug-ins.

Internet organizers and trackers provide specialized tools for capturing and organizing sets of URLs and bookmarks or for storing and organizing material you've captured from the Web. Internet search utilities provide databases and reviews of Web content, typically on CD-ROM, so that you can refine your searches before you log on and start

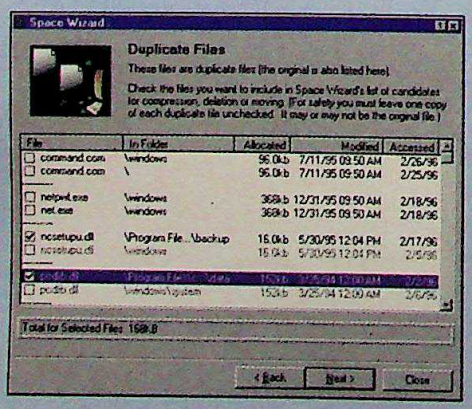
What Makes a Great Utility? *Among the dozens of utilites we looked at, seven*



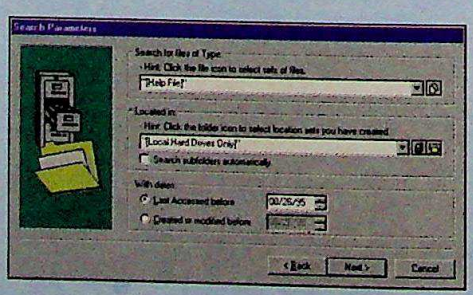
Uninstallers Quarterdeck Corp.'s powerful CleanSweep 95 is the only application uninstaller that reports the exact changes it will make to the Windows 95 Registry. Other applications tell you only that the Registry will be changed without giving any details.



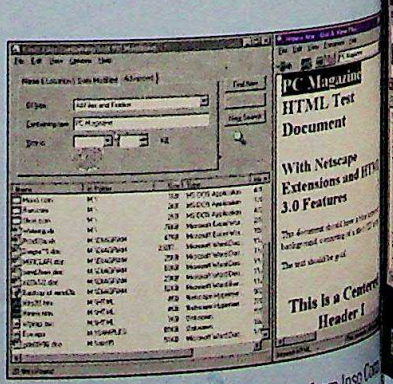
Antivirus Utilities Windows 95 is somewhat safer from virus attack than Windows 3.1 was, but it's not impervious. Auto-Protect real-time scanning in Symantec Corp.'s Norton AntiVirus for Windows 95 adds the necessary layer of protection to make your system safe from virus attack.



The Basics Symantec Corp.'s Norton Utilities adds much-needed tools to Windows 95. Among them is the Norton Space Wizard, which finds duplicate and nonessential files and lets you delete them to recover storage space on your hard disk.



Desktop Enhancers Symantec Corp.'s Norton Navigator adds some welcome intelligence to Windows 95's file management abilities. The File Archive Wizard, for example, scours disks for files of specified categories and ages to be compressed or deleted.



File Viewers Quick View Plus from Inso Corp. has far more power than the limited version included in Windows 95. When you use Windows 95's file finder to search for files that contain specific text, it will then display them with Quick View Plus, the text you searched for is highlighted in the file.

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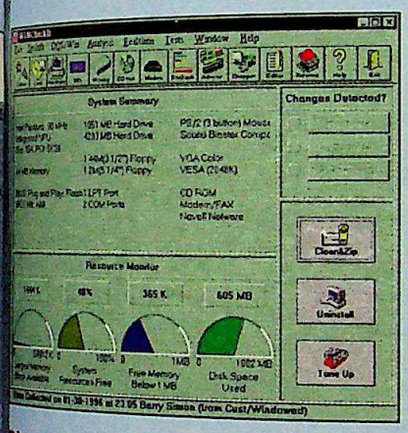
Helper applications and Netscape plug-ins constitute a universe of functionality on their own. Designed to extend your browser's capabilities in specialized areas, they make the Web a conduit for everything from interactive spreadsheets to live video broadcasts to virtual 3-D worlds. Out of the hundreds of helper applications and plug-ins now on the Web, we pick the top 30 in four areas: audio, graphics, video, and virtual reality.

You'll also find an extra section focusing on 40 more Internet utilities in five different categories. No matter what you use the Internet for, you can use it more effectively with the help of some of these tools.

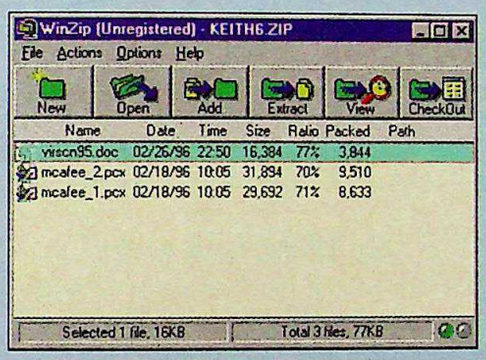
The emergence of the Internet and the release of Windows 95 are changing the way you compute, but one thing has stayed the same: You still need your tools. In fact, you should probably go out and get some new ones.

Our Contributors: PADRAIC BOYLE, SHERYL CANTER, EDWARD MENDELSON, STEVE RIGNEY, WINN L. ROSCH, BARRY SIMON, and CRAIG STINSON are contributing editors of *PC Magazine*. DAVID HASKIN, ESTHER SCHINDLER, and KEITH SCHULTZ are frequent contributors to *PC Magazine*. DR. RICHARD FORD is the director of research for the National Computer Security Association. THOMAS MACE is a senior editor, and LANCE N. ULANOFF is a senior associate editor of *PC Magazine*. DAVID LIDSKY and MICHAEL W. MUCHMORE are staff editors, and EYAL RABINOVITCH is an editorial reseacher at *PC Magazine*. BEN Z. GOTTESMAN and LARRY SELTZER are technical directors, and JAY MUNRO and DAN SMITH are project leaders at *PC Magazine*. DON WILLMOTT was the executive editor in charge of this story.

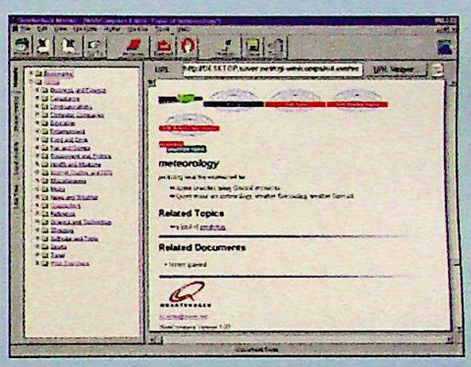
their intelligence, efficiency, and effectiveness. Here are some highlights.



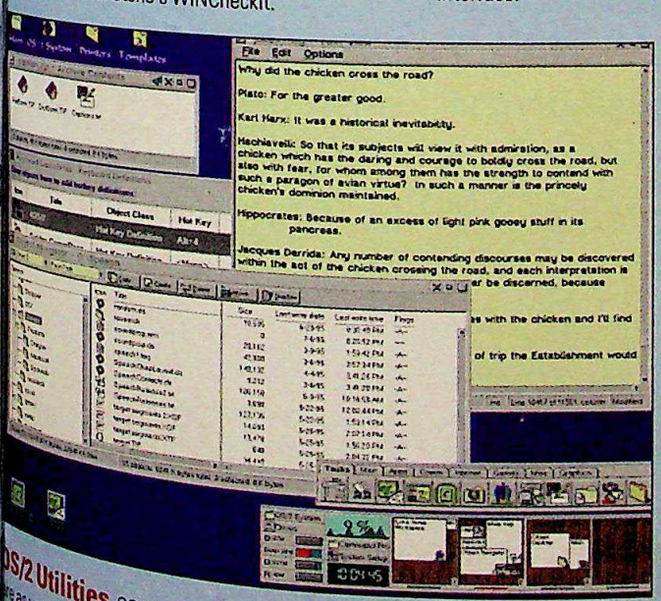
Diagnostic Tools Though Windows 95 includes some basic system diagnostic tools, they can't compare with TouchStone's WINCheckIt.



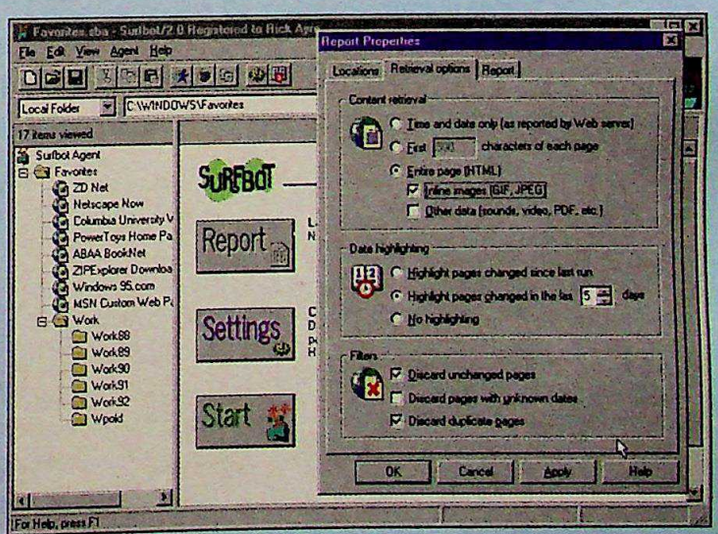
Archive Utilities No Windows 95 desktop should be without a file archiving utility, and Nico Mak Computing's WinZip 6.0 is the one to have. Its small yet efficient interface blends nicely into the Windows 95 interface.



Internet Search Tools The Web is too big to skim like a book. You need some heavy-duty tools to help you dig deep and find the Web info you're looking for. Quarterdeck WebCompass 1.0 is that tool. It offers extensive databases with entries organized by topic.



OS/2 Utilities OS/2 users have a cornucopia of utilities to select from, but few are as versatile as Stardock's Object Desktop. Among the dozens of features are an excellent file manager, Alt-Tab support, a better task list, and .ZIP file viewers that treat the contents as desktop objects.



Internet Organizers The more you surf the Web, the harder it is to keep track of the latest changes to all your favorite sites. Fortunately, Surflogic LLC.'s Surfbot automates the process. It offers powerful and flexible update notification, the greatest range of functions, and the closest integration with Windows 95 and current browsers.

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THE BASICS

WINDOWS 95 LACKS A FEW NECESSARY TOOLS. HERE WE LOOK AT THE BASIC SET OF TOOLS THAT WILL MAKE YOUR WINDOWS 95 SYSTEM MORE COMPLETE.

By Winn L. Rosch

The usefulness of any tool depends on the job you have to do, and most software manufacturers craft utilities to fill some similarly specific needs. You might want a better desktop than the one Microsoft chooses to give you, an expedient way of dispensing with software you no longer want, a means of converting data files from one format to another, backup and antivirus protection for your files, improved memory handling (and more free bytes), or diagnostics for finding system problems. Each of these needs has spawned its own array of specialized utilities, which we will cover separately in the reviews that follow.

Some utilities, however, are useful to nearly everyone and every PC. No matter what kind of PC you have or what you do with it, you want to keep your disk organized and running at top speed, to prevent disasters by detecting disk problems and viruses, and to save your sanity should you accidentally erase a file. Your operating system should incorporate these basic functions, and while some do, some do not.

Speculating as to why your favorite operating system shortchanges you on these basic functions may make for interesting discussions, but the more useful strategy is to take action and decide what you need to add.

GETTING STARTED

Two utility packages rank foremost on any list of utility add-ons. Microsoft Plus! plugs many of the holes still left in Windows 95, adding Web access (though you can now get Internet Explorer for free with the Windows 95 Service Pak). It also includes a program scheduler, prettier screens, enhanced disk compression, and more. Symantec Corp.'s Norton Utilities betters the built-in Windows 95 functions by sidestepping their constraints while adding options and power. Together, these two packages make up the utility basics for any PC.

Windows 95 comes with an impress array of utility functions, mostly for everyday maintenance of your syste Some utility programs are so necess and common that they were regarded part of DOS from the start and now company Windows 95. These incl CHKDSK, DISKCOPY, FORMAT, FDISK. Two more recent additions standard DOS equipment have been ried over as well: ATTRIB allows you mark or unmark files as read-only or h den, or alter the archive bit for exact control of your backups; and DOSK lets you edit the DOS command lin assign sequences of text and command individual keys. And Windows fills t communications needs with its stand HyperTerminal, built-in e-mail and fax cilities, and dial-up networking.

The Windows 95 Recycling Bin g you a second chance should you accid tally delete a file or folder, and repl the Undelete utility that was incl with previous DOS versions. Its safety is incomplete, however, as it doesn't c the removed files that didn't make it the recycling bin—those eliminate

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uninstalling a program or deleted at the DOS prompt, for example.

For normal disk maintenance Windows 95 offers ScanDisk, which finds the lost clusters that Windows manufacturers with abandon, fixes cross-linked files (two files that include the same allocation unit), and runs a surface test to find bad sectors. Useful (and necessary) as it is, the 16-bit



Microsoft Internet Explorer's main screen includes a tabbed interface for easy navigation.

ScanDisk has severe limitations. For example, it truncates cross-links by default, and it gives you few options for control.

DriveSpace 2, the Windows 95 disk compression system, suffers the same indignity. Although it can nominally double your disk storage capacity by packing data more efficiently, DriveSpace 2 is encumbered by 16-bit code. Moreover, Microsoft has limited DriveSpace 2 to volumes no larger than 512MB, when drives of a gigabyte or more really constitute the standard nowadays.

Microsoft Backup, also included with Windows 95, helps you organize and make tape backups of your disk files. Again, however, Microsoft has limited this utility to a few slower and lower-capacity tape drives by including Colorado, Conner, and Iomega, and Wanteg QIC-40, -80, and -3010 drives connected to a floppy disk port or Colorado drives linked through a parallel port.

Microsoft Diagnostics (the program MSD.EXE) accompanied versions of DOS through 6.22 to tell you the details of your systems as an aid in expanding or troubleshooting your PC. Windows 95 omits MSD in favor of Device Manager (part of the System function in Control Panel) which does a much more thorough job—at least as well as many aftermarket reporting programs do. Windows 95 also includes the old DOS program MEM to report memory usage. Microsoft has built memory management into Windows 95 and requires no external utilities in this capacity.

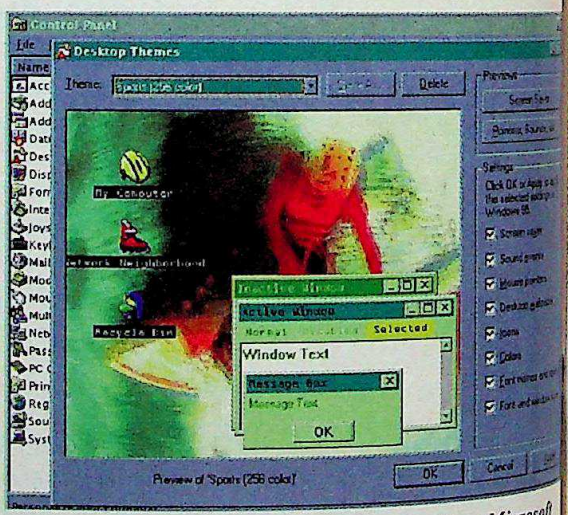
Windows 95 also incorporates minimal internal virus protection. Although it lacks scanning software to detect viruses, Windows 95 warns when programs threaten to change vital disk contents (like the boot record, partition table, and system files), and it automatically checks the integrity of its own files when you boot up.

To help monitor your PC's microprocessor load, Windows 95 also includes System Monitor, which opens a windows with a resource-use display; Resource Meter, which puts a simplified, four-step indicator on your start bar; and Net Watcher, which monitors network traffic.

MICROSOFT PLUS! FOR WINDOWS 95

The $54.95 Plus! package from Microsoft Corp. adds basic functions not included on the Windows 95 CD. They would have fit in terms of disk space but not in universal appeal or, really, in terms of Microsoft's plans.

Most of the space on the Plus! CD is filled by Desktop Themes, software for dressing up your PC should you tire of murky green screens and enthusiastic but uninspired synthesizer riffs. More than just a colorful background, a theme includes wallpaper, sounds, cursors, and icons all designed around a central concept such as wild beasts and bugs, tie-dye and free love, action sports, or Renaissance and early 20th Century technology. Open the new Desktop Themes folder that appears in your Control Panel, and you can use the Themes engine to empower your own creativity. You can pick and choose pieces of themes—wallpaper from one, prettier system icons from another.



The Desktop Theme configuration screen from Microsoft Plus! lets you control a multitude of desktop details.

Plus! also includes System Agent, Microsoft's scheduling system for Windows 95 which allows you to set functions and utilities to run automatically at pre-appointed times. You can set your own schedule or let System Agent choose its own. (It favors the wee hours). But it can extract a toll, at times swallowing most of the speed of a 66 MHz 486DX/2. On two test systems it brought keystroking to a near halt every 15 minutes even when nothing was scheduled (a problem Microsoft was unable to duplicate, let alone explain).

The DriveSpace 3 disk compression included with Plus! (which won an Editors' Choice in our evaluation of disk compression tools, "Picking Up the Pieces," November 21, 1995) improves on Windows 95's standard DriveSpace with options to let you balance speed and capacity, higher compression ratios and improved performance. DriveSpace 3 adds two advanced compression options: HiPack, which works on the fly and promises to squeeze an extra 10 to 15 percent (Microsoft's figures) from your hard disk; and UltraPack, which runs off-line, typically at night as scheduled by Compression Agent, and wrings out the last available byte.

On our tests, DriveSpace HiPack proved slightly faster than its forebear. The improvement ranged from a 10 percent boost on uncompressible files (from 40.5 to 36.6 seconds to write 10MB) to 40 percent with highly compressible files (from 19.4 to 13.2 seconds to write 10MB). On tests of its overall performance, DriveSpace 3 slowed the system by about 10 percent on an 8MB 486 and less than 3 percent on a 16MB Pentium 90.

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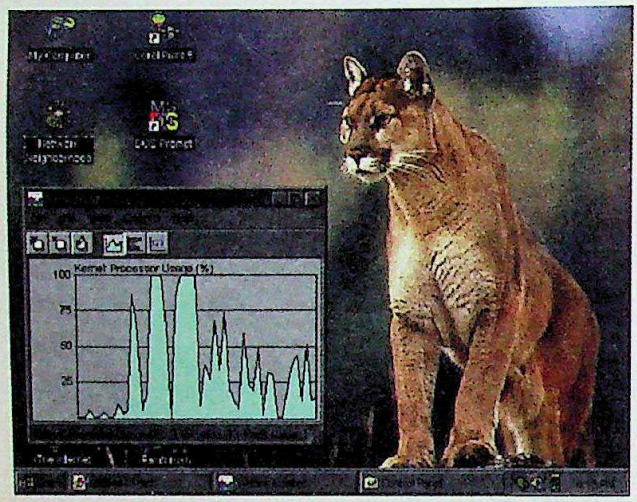
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The Plus! CD also includes Internet Explorer, Microsoft's answer to Netscape Navigator. Although less acclaimed than Navigator, the Mosaic-based Explorer does integrate well with Windows 95. Note that Plus! actually includes an obsolete version of Explorer. When you first log in, Plus! offers you a download of the current version (2.0) for free. You can also download it free from Microsoft and other sources. A review of Explorer 2.0 appears in "Just Browsing" in our issue of March 12, 1996.



Along with the nature theme desktop, Microsoft Plus! also includes the system monitor.

To coax you over to using Microsoft as your Internet provider, Plus! includes 10 hours of free Internet access through the Microsoft Network, which is equivalent to a month's free access just for dialing in. Plus! annoyingly installs the Explorer icon along with MSN and your inbox icon semi-permanently on your desktop—if Windows hasn't already done so—but you can move them with an add-on utility such as TweakUI.

You can make your PC into your own server—though not on the Internet—with the Dial-Up Networking Server included with Plus! The server also allows your PC to answer your phone (if you have a modem, of course) and link its disks to a remote system through the telephone line, albeit at modem speed.

NORTON UTILITIES FOR WINDOWS 95

When you have a problem with a disk—be it an erased file or a bad sector—your dealer or consultant will likely recommend Norton Utilities. The package has grown in each of its nine previous versions since 1981, but this tenth version marks a change in direction. Conceding that many of Norton's traditional functions are built into Windows 95, Symantec Corp. refocuses on its core, endowing the $119 package ($129 on CD, which also includes three reference books) with 32-bit performance and greater automation and integration with Windows 95. Even the DOS-based programs in the package (they run in MS-DOS mode because they need exclusive access to your hardware) recognize and preserve Windows 95 features such as long filenames.

Your dealer's recommendations notwithstanding, Norton does not fix disk hardware failures or surface damage: Not much can repair a real disk disaster. The Norton Disk Doctor does, however, fix problems with the data recorded on disk, including lost clusters, cross-linked files, and damaged allocation tables. Although Windows 95 handles these functions too, Norton often takes an extra step; for example, it traces the full length of cross-linked files rather than truncating them. In addition, Norton lets you make an "undo" disk, so even if your efforts go awry, you won't ever be worse off than when you started. Like Windows 95's ScanDisk, Norton makes surface tests, but it repeats the process multiple times.

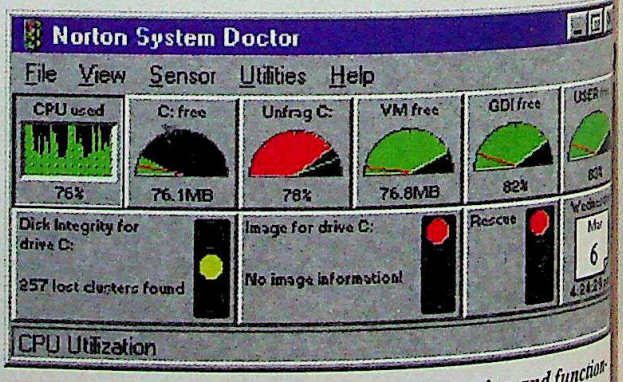
Speed Disk, Norton's disk defragmenter, improves on Windows 95's Disk Defragmenter primarily by offering more options. You can reorder your folders (directories) and put them at the beginning of your disk, arrange files by creation date and last access, or even specify which files to put where. Norton will also optionally defragment your swap file—something Windows 95 won't even attempt.

Although the use of 32-bit code should give Norton an innate edge over the 16-bit defrag code in Windows 95, you can't directly compare performan because Norton offers many more o tions than found in Windows 95. Norto file-only defrag finishes in a fraction the time of Windows 95, but a thoro job with reordering takes substantia longer. The only annoying aspect Speed Disk (and Norton in general) is incomplete integration with the rest the package. On encountering a d error, Speed Disk dumps you into Nor Disk Doctor and then leaves the scene stead of resuming the job.

Norton Recycling Bin adds a furth layer of protection to Windows 95's rec cling bin. When you install Norton P tect, the files you empty from the rec cling bin are dumped into a hidd directory where they reside as "last- sort" insurance until your system nee their space. This design sometimes cau misleading reports of disk space and c allocation displays (such as those made Speed Disk), because some softwa doesn't realize that the protected fil space automatically frees up upon d mand. Further confounding the situati Norton installed its protected recycli bin even when we told it not to, a bug t Symantec confirmed.

Better is Norton's Unerase Wiza which recovers even those files not tos into the recycling bin. Running the wiz basically involves a question-and-answ session, one in which the wizard kno most of the answers even if you don Your responses merely narrow down t wizard's list of erased files. Tell it nothi and you can choose from every erased f on your disk. In testing, the wizard reco ered every file we deleted.

Norton's Space Wizard helps you e the last bit of capacity from your d

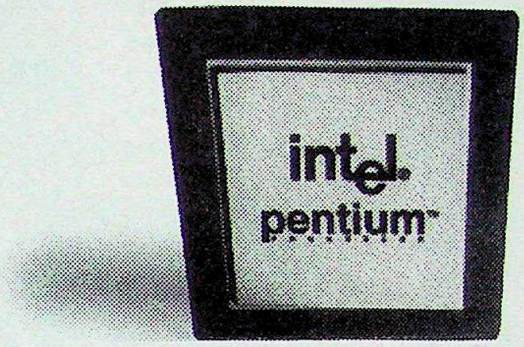


Norton System Doctor gives you more information and functionality than what's offered natively under Windows 95.

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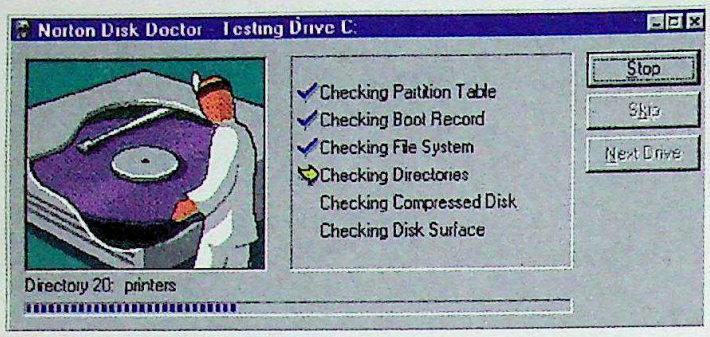
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Symantec's Norton Disk Doctor checks your system's vital statistics and offers valuable feedback.

through streamlining instead of compression. It unclutters your hard disk by eliminating redundant or useless files and putting away those you rarely use. Its best (but most time-consuming) feature is its ability to find duplicate files scattered across your disk—not just files with the same name but those with identical contents based on a true byte-by-byte comparison.

Thanks to thoughtful design, the Space Wizard doesn't automatically eliminate any file but instead provides you with a convenient menu for erasing the excess baggage. Exercise your discretion, because Space Wizard doesn't know which files your applications need, and it may prompt you to eliminate a necessary file.

Norton System Doctor can overwhelm you with high-tech dials and gauges that monitor nearly every aspect of your PC's operation. Doctor acts best when you push it into the background, where it discreetly checks system parameters, such as free resources and disk space, while you are working.

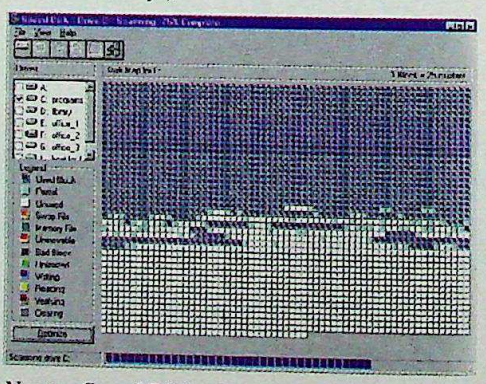
You can program Doctor to take corrective action rather than simply warn you when a problem arises. Think of it as an event-driven scheduling system compared with System Agent's time-driven system, although each does have elements of the other.

System Information, Norton's reporting system that tells you what's in your PC, organizes better, but less thoroughly, than Windows 95's own Device Manager. Its chief addition is a one-number benchmark that lets you quickly compare the performance of PCs. It tests differently from previous System Information versions (it now tests with 32-bit code), so results from new and old Norton versions don't jibe.

Disk Editor continues the tradition of the original Norton Utilities by allowing you to view or alter any byte on your hard disk, from the active data area to the partition table. Norton can also create a rescue disk that stores essential data from your hard disk (including the registry), as well as a vestigial operating system so you can boot up your system to make repairs.

You can certainly choose to use your PC without either of these basic utility packages, just as you can choose to drive a car without a spare tire. More than rectifying emergencies, however, these utilities help prevent disasters and make your PC easier and more fun to use. N

Microsoft Plus! for Windows 95. List price: $54.95. Requires: 486-based PC or better, 4MB RAM, 25MB disk space, 8-bit sound board, 256-color VGA or better, 2X CD drive, modem, Microsoft Windows 95. Microsoft Corp., Redmond, WA. *(Indian subsidiary Microsoft India, New Delhi; Indian partners Datapro Infoworld, Pune; Godrej, Bombay; Sonata, Bangalore; TUL Bombay.)*



Norton Speed Disk offers more options than Windows 95's display.

Norton Utilities for Windows 95. Estimated street price: $119, $59.95 upgrade, $129 CD-ROM, $69.95 CD-ROM upgrade. Requires: 486SX-based PC or better, 4MB RAM, 16MB disk space, 16-bit sound board, 256-color VGA or better, 2X-speed CD drive, Microsoft Windows 95. Symantec Corp., Cupertino, CA. *(Indian partners Infosys Technologies Bangalore; Sonata, Bangalore.)*

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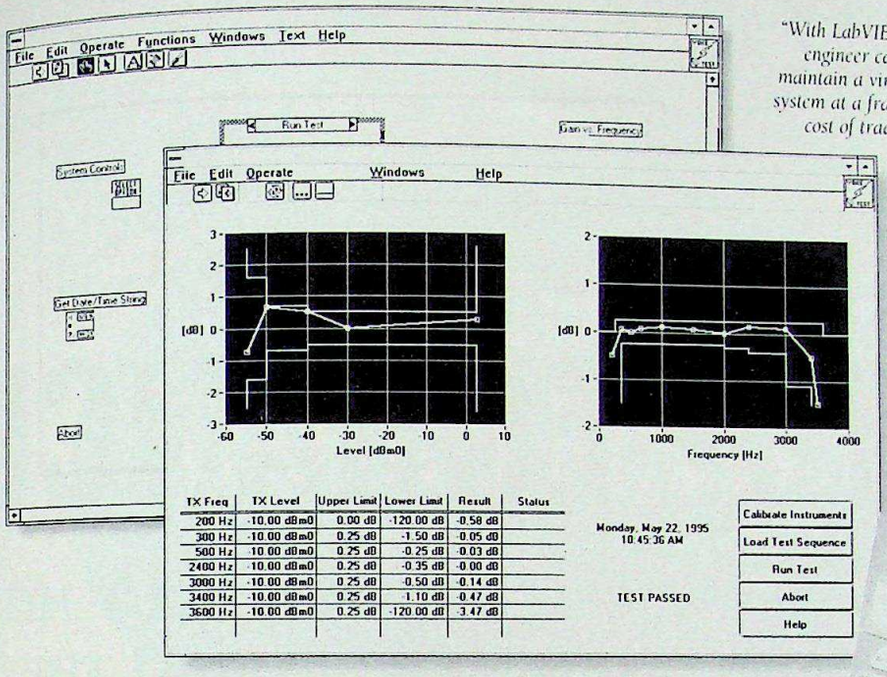
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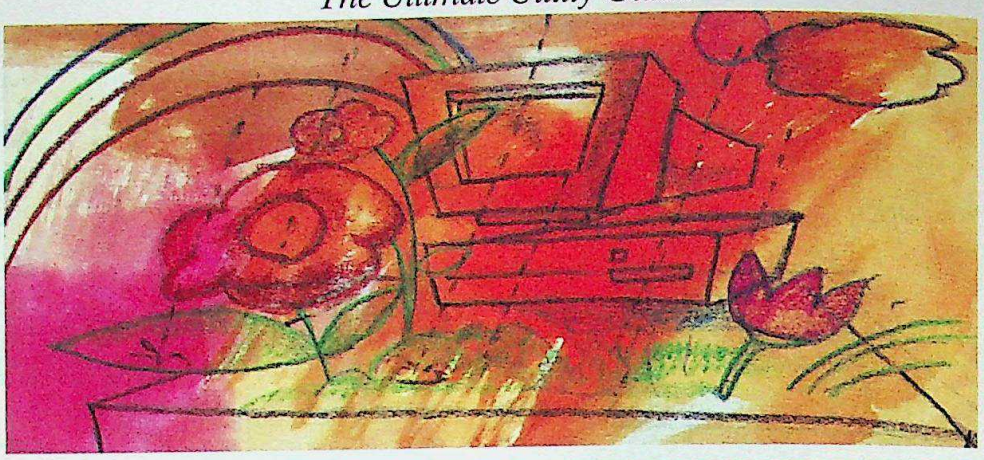
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DESKTOP ENHANCERS

IF WINDOWS 95'S INTERFACE DOESN'T QUITE HIT THE MARK FOR YOU, THEN TAKE A CLOSE LOOK AT THE VARIOUS MAKEOVERS THESE DESKTOP ENHANCERS OFFER.

By Edward Mendelson

The desktop, icons, Start menu, and Taskbar that you see when you start Windows 95 were all put there by a program called Explorer. Its interface is efficient and tightly integrated, but if you don't like it you can replace it or improve it. Manufacturers have developed third-party utilities designed to supplement or enhance the Explorer interface. But you won't find total replacements for the interface, unlike during the Windows 3.*x* era, when you could entirely replace Program Manager with the Norton Desktop for Windows, PC Tools for Windows, or any of a dozen other replacements.

Enhancements to Explorer include full-featured control-panel programs like Dashboard 95 and PowerDesk; simple or elaborate launch menus and toolbars such as EasyDesktop, Lightning Power Controls 95, TabWorks, and WitchDesk; and less visible but more densely integrated enhancements including those in Norton Navigator and Microsoft's no-charge PowerToys. PowerDesk and Norton Navigator include file-manager programs that aren't as limited as Explorer's file windows, but aren't as well-integrated into Windows 95.

The only full-scale replacement for the Windows Explorer comes with Windows 95 itself, in the form of slightly improved versions of the Windows 3.*x* Program Manager and File Manager. If you want to return a modified version of the Windows 3.*x* interface, edit your SYSTEM.INI file and replace the line "shell=explorer.exe" with "shell=progman.exe" and restart Windows. You'll lose the Taskbar and the Start menu, so you'll probably prefer to keep Explorer and use one of the enhancement programs reviewed here instead.

Explorer isn't perfect. Windows 95 lacks a macro recorder that works with 32-bit applications, and its Start menu doesn't let you add commands to jump directly to one of an application's menu items. Earlier generations of desktop enhancers came with recorder and scripting utilities, t editors, shortcut menus, keyboard m and other utilities that aren't in the curr versions. And the older versions, w they work at all, don't fully support new features in Windows 95. The p grams reviewed here ultimately mak good beginning, but the best Windows enhancements are probably yet to co

STARFISH SOFTWARE

Dashboard 95

In the old days of Windows 3.1, Da board's instrument-panel metaphor with its numerous small icons for ap cations, printers, virtual desktops, system gauges—helped to clarify and ganize many of Windows's normally s tered and disorganized functions. In better-organized and more graphical of Windows 95, Starfish Software's $4 Dashboard 95 still provides quick ac to crucial Windows features, and its v able "layout" feature lets you load gro of applications into one or more vir desktops with a single mouse click.

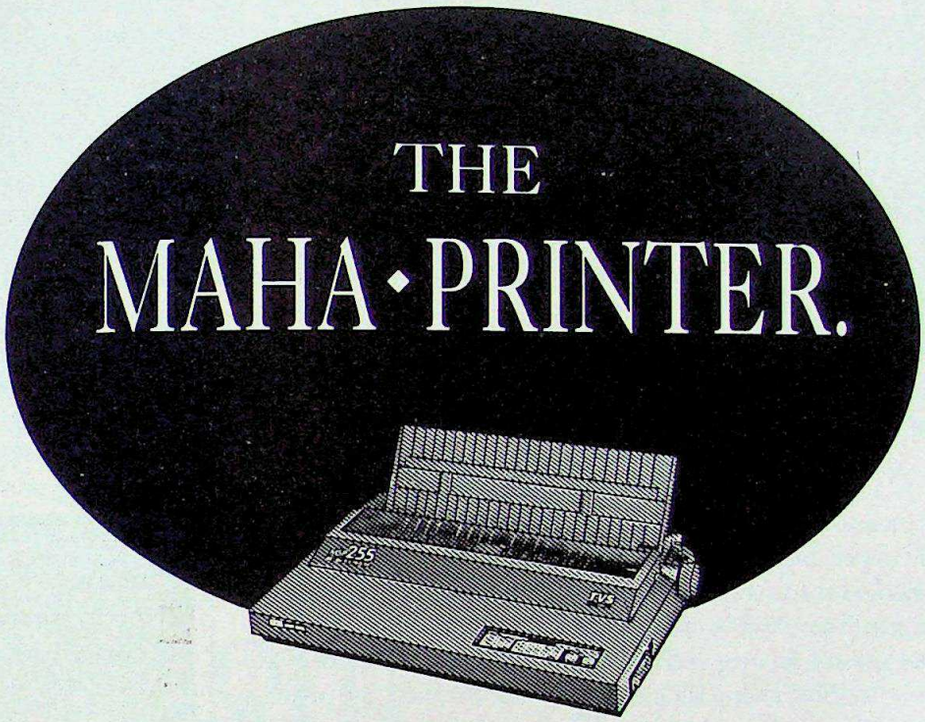
But Dashboard also adds compl and clutter to the Windows interface it needlessly duplicates features prov

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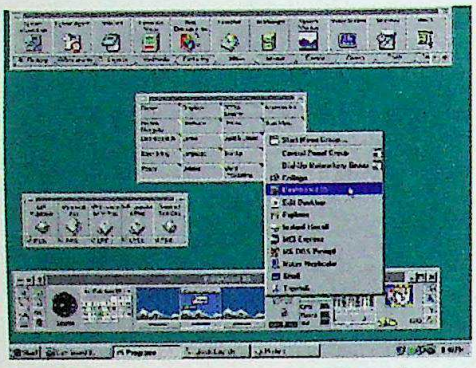
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more effectively by Windows itself. Unlike the similar PowerDesk, Dashboard 95 doesn't include file management features and doesn't integrate tightly with the Windows shell. Though loyalists of earlier versions probably will want to upgrade, potential new users may think twice.



Dashboard 95 takes up considerable real estate on-screen when expanded to its full size.

Dashboard starts out as a single control panel, but you can split it into as many as five separate panels that either float on your screen or attach themselves to a screen border. The main panel displays miniature images of virtual screens, icons for accessing Windows tools like Find and Explorer, an alarm clock and calendar, system gauges, and either a poker game, slot machine, or scramble puzzle. One of its icons leads to a cleverly designed Run box that lets you run internal DOS commands—actually simulated versions of DOS commands—in a small window instead of opening a separate DOS window.

DASHING PANELS

One snap-off panel is a Taskbar that resembles the Windows 95 Taskbar except that it adds the option to float anywhere on screen and doesn't display the tray icons or the clock that Windows 95 displays on its own Taskbar. Another snap-off panel has icons for all your printers, with a green light to indicate the default printer and an optional icon that shows the current paper orientation. You can change default printers with a mouse click and drop files on a printer icon to print them. This panel one-ups Windows's own printer icons by indicating the current default printer at a glance.

A third panel displays a button that matches each of your Start menu groups, and lets you create custom groups. The first time you click on any of these buttons during a session, you'll wait a few seconds for Dashboard to read the menu entries. Then it pops up a list of menu items, along with an item at the top that opens the menu in the form of an Explorer group window. But when you click on a submenu item, the upper-level menu disappears, which can make navigation difficult.

The fourth snap-off panel is a tabbed toolbar in which your applications are organized automatically by Dashboard in categories like multimedia, publishing, and others. You can customize these categories, but this tabbed toolbar essentially provides another way to access the following: the same items accessible from the panel, based on your Start menu groups (with the addition of tabs for your desktop icons); recently-used documents; and multiple-application "layouts."

Resizing Dashboard's panels may frustrate you. When you expand one panel, another one often shrinks, even though the screen has enough room. And when you attempt to restore the shrunken panel, another panel may change its size in the process.

Dashboard holds promise as an extensible system, and Starfish Software is readying a version called Internet Dashboard that will organize Internet addresses. But as a vehicle for organizing Windows 95 itself, Dashboard comes across as weighed down by too much luggage from earlier versions.—*Edward Mendelson*

Dashboard 95. Estimated street price: $49.95. Requires: 486 CPU, 4MB RAM, 5MB hard disk space, Microsoft Windows 95. Starfish Software, Scotts Valley, CA.

(No Indian partner.)

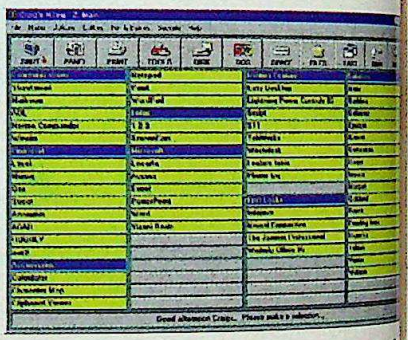
MICROSECONDS INTERNATIONAL INC.

EasyDesktop

An icon may well be worth about 1,024 words, but too many little bitmaps can drive a Windows user to despair. This appears to be the philosophy behind MicroSeconds' EasyDesktop, a shell utility for folks who like to read before they launch. The $59.95 EasyDesktop 6.0 implants a ten-page *text-based* menu in the center of your screen, where you can launch up to 76 items per page.

To help you find your way, Easy Desktop lets you name the pages and select them from a drop-down menu. The program remembers which page you were most recently working on, you can easily set up particular pages for specific projects or users. Anything to which you assign a Windows 95 shortcut can become an EasyDesktop menu entry. (If you launch a folder from a menu item, however, EasyDesktop will open it in a simple folder window, even if you have changed your registry to make Explorer the default action for folders.)

The EasyDesktop window itself occupies more than 90 percent of your screen. It adjusts its size automatically if you switch from standard VGA (640 by 480) to 800 by 600 pixel resolution. You can switch to the EasyDesktop window directly from any application by pressing the Pause key, and a second press of the key sends the program window to the back and returns you to your application. The physical dimensions of the utility, however, may bother some users who like the leaner profile of icon-based tools such as PowerDesk and Dashboard 95.



EasyDesktop 6.0 lets you build ten pages of text-based menus.

EASY COME, EASY GO

In EasyDesktop, you can: customize launch items with the standard Windows 95 shortcut properties, such as command-line parameter, startup directory, keyboard shortcut, initial window state, and some unusual extras; assign a .WAV or .AVI file to an item that lets you see or hear instructions upon opening a program or document; and deliver particular keystrokes to a document or application upon launch with the help of a somewhat clumsy macro dialog box.

To help you set up your first menu, EasyDesktop volunteers to convert each item on any node of your Start menu. You may also drag and drop objects from your desktop or folders to new menu slots.

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Shree Lipi : Shree Lipi is an Indian Language script processor under MS Windows, with a collection of fonts and utilities compatible with both **IBM PC and Macintosh**. The ultimate in desktop publishing, it supports the largest collection of Indian typefaces in all Indian scripts and has a variety of keyboard layouts.

Shabda Sagar : Shabda Sagar is a DOS based **multilingual word processor** with commands that are similar to Word Star. User friendly to the core, it supports a majority of printers in use. Another attractive option is the availability of a variety of keyboard layouts.

Shree Lekha : Shree Lekha is a DOS based Indian language script processor available with **fonts for multimedia** video graphics. Its diverse features support various applications including Autodesk Animator & 3D Studio etc.

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Multikeys : Multikeys is a DOS based keyboard layout handler for Indian Languages to be used with GIST cards. It allows the use of popular keyboard layouts like Modular, Godrej, Ramington etc. Also available is a program for generating user defined layouts.

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Norton Navigator

When Microsoft shipped Windows 95 last year, most users considered the new interface a vast improvement over Windows 3.1's Program Manager. On the other hand, the Windows Explorer has its detractors, and even the most loyal Windows 95 users are aware of the desktop's limitations. Products like our Editors' Choice desktop enhancer, Symantec Corp.'s Norton Navigator, help erase many of those problems.

Along with virtual desktops and Taskbar icons for launching applications, Norton Navigator adds a level of convenience that's lacking under vanilla Windows 95. Its File Manager offers direct access to FTP sites (they appear as directories) and the ability to view zipped files as if they were simply other directories on your hard disk drive. These features alone beat the Windows Explorer file manager by a mile.

Norton Navigator also reaches off the desktop and into your applications: For example, it adds a list of most recently used files to your file dialog boxes.

We do recommend, however, that you think about whether or not you want to install *everything* Navigator offers—it can slow your system down.

Two other products deserve mentioning. MicroHelp's affordable PowerDesk features a handy toolbar wizard and a drag-and-drop property sheet. Though PowerDesk isn't quite as feature-rich as Navigator, its exceptional Explorer replacement, Explorer Plus, adds useful features such as .ZIP compression services. Likewise, Microsoft's Windows 95 PowerToys, though not as full-featured as Navigator, does give you a lot for little: Downloadable from the Web, PowerToys features the handy TweakUI, an applet that serves as your passport to controls that normally entail complicated tweaking with the Registry.

once items appear on the menu, rearranging them proved difficult; in most cases, you must invoke a special drag modality.

STRAIGHT FROM THE DESKTOP

Besides the menus, EasyDesktop provides numerous aids for file management and system maintenance: For example, the utility provides direct access to individual Control Panel applets and lets you change the default printer or print orientation with a simple menu pick. Other commands take you straight to ScanDisk, DriveSpace, the defragger, the Windows Backup program, Microsoft's system and performance monitors, and the Recycle Bin.

Meanwhile, newly added context-menu commands simplify file relocation, allow you to split files across multiple floppy disks, and provide .ZIP compression and expansion services. In addition to all this, EasyDesktop has its own alternative calculator, a CD player, a font sampler, a special-character inserter, an alarm feature with room for 15 timed alarms, a system information table, and five games.

EasyDesktop offers a wealth of good stuff. Even if you basically feel at home with the Start menu, you may find the other goodies and the simplified access to Windows 95's services worth the admission price. In particular, if you're looking to get away from Windows 95's iconic world, EasyDesktop may be the desktop enhancer for you.—*Craig Stinson*

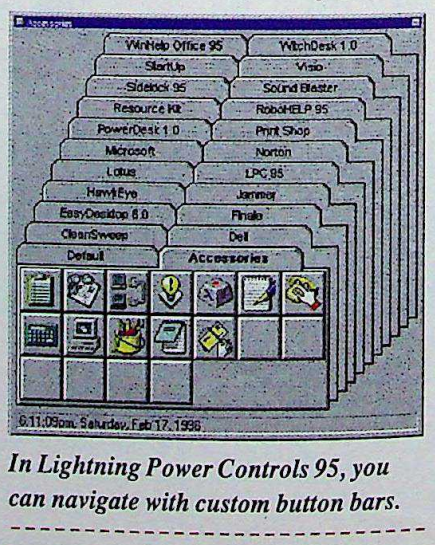
EasyDesktop 6.0. List price: $59.95. Requires: 386-based PC or better, 8MB RAM, 5MB hard disk space, Microsoft Windows 95. MicroSeconds International Inc., Rancho Santa Fe, CA.

(No Indian partner.)

LUCID CORP.

Lightning Power Controls 95

Lucid bills its $49.95 Lightning Power Controls 95 as a utility for the power hungry. The program allows you to set up icons for launching programs, opening documents, switching between virtual desktops, monitoring system resources, displaying system information, sending commands and keystrokes to applications, and shutting down Windows. Unfortunately, a considerable amount of complexity comes with these features.



In Lightning Power Controls 95, you can navigate with custom button bars.

Lightning Power Controls—which ships only on CD-ROM and operates under Windows 3.1 as well as Windows 95—is hobbled by obtuse terminology, a Byzantine command structure, and sparse documentation. Once you've found your way, however, you'll be able to create tabbed dialog boxes in which each tab displays a set of functionally related icons. To help you remember what the icons stand for, you can assign a help string to each. Your string either pops up beside the button when you rest your mouse or appears in the status bar at the bottom of the window.

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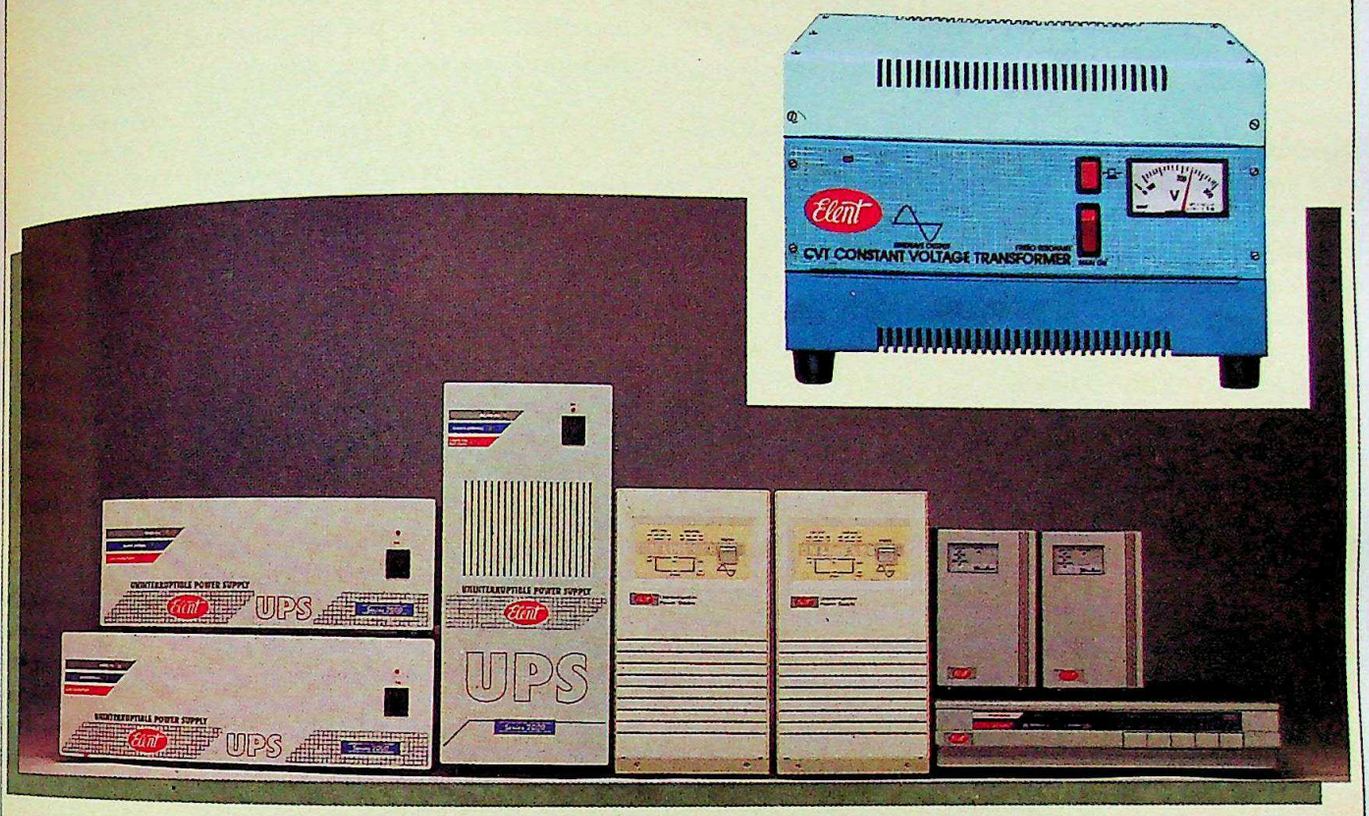
The entire windowful of icons stays on top by default, but you can make it covered if you prefer. A right-click on the window's title bar rolls the window up so all you see is the bar. A second right-click there rolls the window back down. You can press Esc to minimize the window or press Break to restore the window and transfer the focus to it. This unusual mouse and keyboard procedure keep Lightning Power Controls from cluttering your screen and mitigate the program's inadequacies: You can dock the window, set it to an "auto hide" mode, or merge the window's icons with your Windows Taskbar.

As an alternative to the Start me

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Lightning Power Controls supplies a command to build (and rebuild as necessary) launch icons from your Program Manager groups (that is, from the Program's submenu of your Start menu). Thus, you can easily transform your Accessories menu into one set of icons, your Startup menu into another, and so on. But, like the comparable feature in TabWorks, this command ignores any items below the top level of your Programs menu.

Lightning Power Controls provides a few capabilities that you won't find in the standard Windows 95 user interface, such as a toolbar in Notepad. Once you've assigned an entire tab of your button-bar window to a particular application, then Lightning Power Controls makes every item in that application's menu tree assignable to nearly any button in the window. The resulting toolbar won't live within Notepad, but you'll be able to use it as though it did. You can also make these buttons deliver keystrokes to applications. But you can't apply the resulting uneditable macros to more than one application at a time, and they don't support mouse actions.

The application's resource monitor includes a convenient "snapshot" service that lets you measure the incremental impact of an application on your GDI and User heaps. And a Clipboard recall feature provides a crude form of scrapbook capability to let you repaste items long gone from the system Clipboard.

On the short side, Lightning Power Controls lacks file-management tools and does nothing to simplify your use of the various Windows 95 system-management tools. It supports long filenames and universal naming convention (UNC) paths, but it won't help you change printers, install drivers, defrag your disk, open a recent document, or troubleshoot a resource conflict. And with Program Manager out of the picture, simply duplicating sections of your Start menu on a set of button bars seems like a lot of work for minimal gain.—*CS*

Lightning Power Controls 95. Estimated street price: $49.95. Requires: 386-based PC or better, 4MB RAM, 4MB hard disk space, 2X CD-ROM drive, Microsoft Windows 3.1 or later. Lucid Corp., Richardson, TX.

(No Indian partner.)

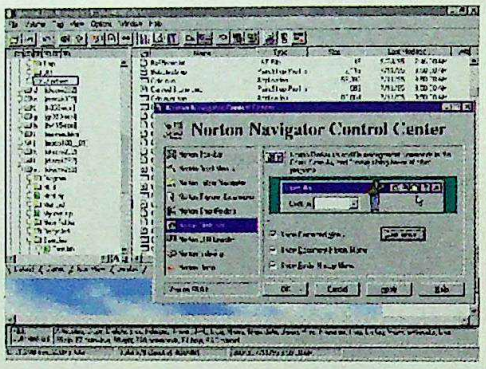
SYMANTEC CORP.

Norton Navigator

PC MAGAZINE EDITORS' CHOICE

Symantec Corp.'s Norton Navigator ($99.95) can take over your Windows environment, adding virtual desktops and Taskbar icons for launching applications, or it can work almost invisibly, adding convenience and efficiency throughout your Windows environment. Either way, it's the most effective Windows enhancement on the market.

In its latest incarnation, Norton Navigator now includes long file name support to 16-bit dialog boxes, drop-down lists of file-management commands, lists of most recently used (MRU) files, directories to



The background shows the Norton File Manager. The control center is in the foreground.

File/Open and File/Save dialog boxes, and an elaborate Undo feature for all Windows file operations. Keep in mind, though, that you may not want to install all that Navigator offers, as it may slow your system down a bit.

The most ingenious and original parts of Norton Navigator are the least visible. The MRU lists, available from tiny icons in file dialog boxes, can save you thousands of keystrokes, and the latest version of the program adds these dialogs both to standard Windows dialog boxes and to the dialog boxes found in Microsoft Office applications. You can decide which commands to add to the optional list of file management commands that drops down from a similar tiny icon. Symantec has added long file name support so unobtrusively that only the letters "LFN" in 16-bit dialogs indicate its presence.

Symantec also added commands to the pop-up context menus of Windows Explorer so you can zip, unzip, move, or copy files using well-designed dialog boxes. These commands don't include keyboard shortcuts; you have to choose them with the mouse or use the arrow keys to navigate the context menu, unlike the commands in PowerDesk.

The more visible features include a special area of the Windows Taskbar, where you can drag icons of applications or files that you want to access quickly without going to the Start menu or desktop. The same region includes miniature images of any virtual windows you create, if you want to keep separate applications or groups of applications on separate desktops.

The Norton File Manager looks and acts more like the Windows 3.x file manager than the Windows 95 Explorer, except for the optional pane that displays files using the Quick View viewers, which come with Windows, or the add-on viewers of Quick View Plus. Norton File Manager treats .ZIP files as directories, so you can view a file compressed in a .ZIP archive simply by moving the highlight to it in the file-list pane. Diehard users of XTree for DOS can use its fast one-keystroke shortcuts. And an innovative list of dozens of useful FTP sites appears below the list of local drives and network drives.

The file manager also includes a very convenient tab that displays deleted files and your chances of recovering them, as well as an elaborate file searcher that optionally uses indexes created in the background. You can also search more specifically than you can in Windows's own finder. In addition, a "smart folder" feature creates desktop folders with shortcuts to files that fit the name and date specifications that you choose. These folders conveniently update themselves in the background so that their lists of shortcuts always remain up-to-date.

You may not need all the more visible features of the Norton Navigator, but anyone who has used the program's less visible features will ever want to run Windows 95 without them. If you want to extend your Windows system, look no further than Norton Navigator.—*EM*

Norton Navigator. Estimated street price: $99.95. Requires:, 486-based PC or better, 8MB RAM, 8MB hard disk space, Microsoft Windows 95. Symantec Corp., Cupertino CA.

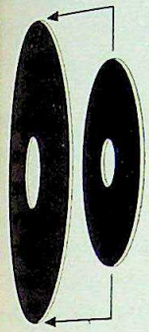
(Indian partners Infosys Technologies, Bangalore; Sonata, Bangalore.)

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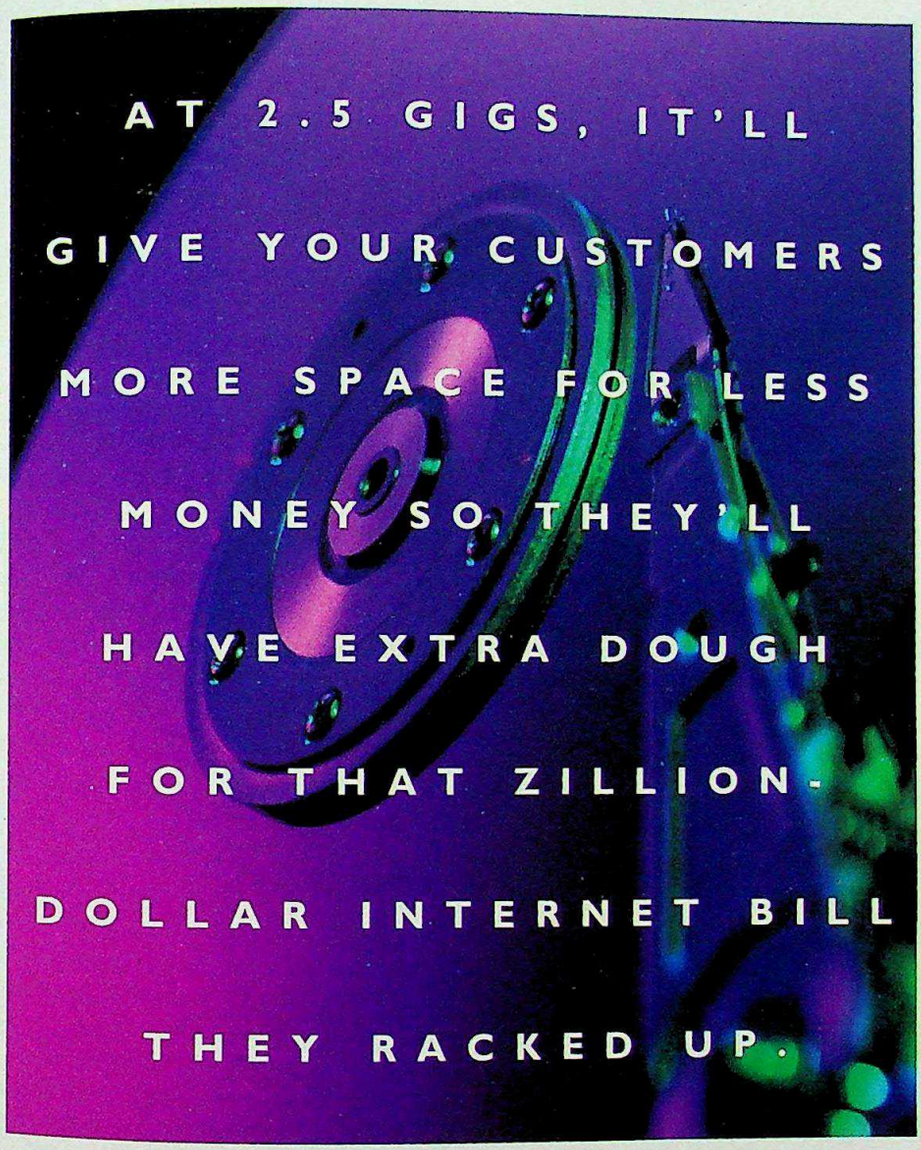
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Desktop Enhancers

PC MAGAZINE EDITORS' CHOICE

m YES NO	Dashboard 95	Easy-Desktop 6.0	Lightning Power Controls 95	Norton Navigator	PowerDesk 1.0	PowerToys	TabWorks 2.0	WitchDesk 1.0
Displays virtual desktops	m		m	m	m			
Keyboard-only access to all features	m	m					m	
Enhances context menu		m		m	m	m		
Custom menus	m	m	m	m				
Supports multiple toolbars	m		m		m		m	
Adds long-filename support to Windows 3.1 applications				m				
Integrated .ZIP file support		m		m	m			
Contains macro recorder		m	m					m

MICROHELP

PowerDesk

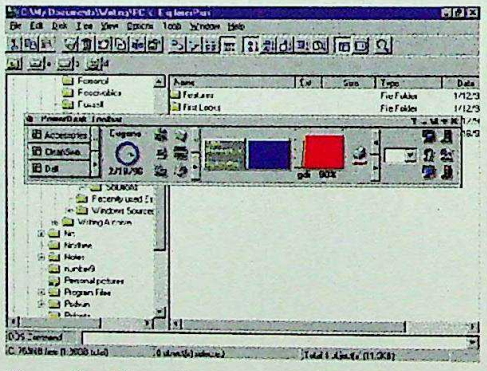
The $49.95 PowerDesk 1.0 from MicroHelp is really two distinct utilities rolled into a single package: a customizable tool bar, comparable to Dashboard 95, and an enhanced alternative to Windows Explorer, comparable to the file manager shipped with Norton Navigator.

Unlike several of its competitors, MicroHelp developed PowerDesk specifically for Windows 95. Accordingly, it not only supports long filenames, UNC paths, and drag and drop customization, but it also provides direct access to some of the more distant reaches of the Windows 95 shell.

POWER PLAYS

PowerDesk's tool bar avoids screen clutter by offering an auto-hide mode, as well as options to merge its tools with the standard Windows task bar or to simply let the tool bar float. In auto-hide mode, you dock against any screen edge, but PowerDesk makes the bar invisible until you point to it. When the tool bar is merged with the task bar, you can only access certain PowerDesk features. Because the system allows multiple tool bars, you can keep some items on the task bar and others in a docked or floating bar. Whatever mode you choose, you can summon and dismiss the tool bar with a keyboard shortcut, but you can't Alt-Tab like you can in EasyDesktop, Lightning Power Controls, and WitchDesk.

A wizard assists you in setting up your tool bars, and an intelligently designed property sheet lets you use drag-and-drop techniques to rearrange the furniture. A toolbar can have any or all of eight elements: a set of menus that recreate selected sections of your Programs menu; a section of icons that mimic ordinary desktop shortcuts; one or more clocks, which may be set to any time zone; a section for managing up to 16 virtual desktops; a section for monitoring system resources, open threads, CPU usage, and free disk space; a set of drag-and-drop printing targets; a DOS command line, with history; and a set of icons for shutting down and restarting, switching to DOS mode, logging on as a different user, and changing the display resolution (but not the color depth).



PowerDesk's toolbar provides quick access to programs, printers, and system functions.

ONE STEP AHEAD

You can customize your keyboard shortcuts and add "sticky apps" to your virtual desktops. (Sticky apps are programs that you designate to appear on all virtual desktops). Resource monitors can sound alarms at specified thresholds, and the PowerDesk command line smartly accepts certain internal DOS commands, such as DIR, that the Windows 95's own Run command rejects. However, the tool bar doesn't support the Start menu's recent-document list. MicroHelp says version 1.1, which should be ready by the time you read this, will remedy this, as well as add access to Control Panel applets.

Among other things, ExplorerPlus, the PowerDesk file manager, provides ZIP compression services, an optional viewer pane (which includes a hex-dump feature), a customizable tool bar, and a drive bar comparable to the one in the Windows File Manager. A check box, well hidden in this program's Options menu, lets you send (delete) files to the Recycle Bin from the DOS command line, and additions to the context menu for files and folders you copy and move with the help of a target browser. Other commands in ExplorerPlus allow Recycle Bin maintenance and access to the Windows Find utility as well as to the Add/Remove Programs applet. But access to ScanDisk, DriveSpace, the defragger, and Backup is missing from PowerDesk.

PowerDesk is an unobtrusive, unpretentious, useful set of tools. You will likely get your $49.95's worth from either the toolbar or ExplorerPlus, and the combination amounts to genuine value.—**PowerDesk 1.0.** Estimated street price $49.95. Requires: 486-based PC or better, 8MB RAM, 2MB hard disk space, Microsoft Windows 95. MicroHelp, Marietta, GA.

(No Indian partner.)

MICROSOFT CORP.

PowerToys

Microsoft Corp.'s PowerToys make Windows 95 more convenient, customizable, and powerful than you ever imagined, and won't cost you anything except the connect time to download them from the company's Web site.

The programmers who worked on Windows itself wrote PowerToys, so

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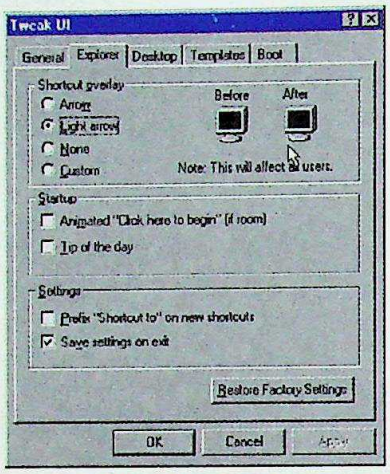
Why ZD's PC Benchmark Team, and Not PC WorldBench, sets the standard for the Industry

○ Winstone 32 and Winstone 96 provide a complete team that runs a total of 21 business applications. Winstone 32 includes eight 32-bit business applications from five different vendors. Winstone 96 includes 13 16-bit business applications from six different vendors.	○ PC WorldBench uses only three 16-bit applications and three 32-bit applications from a total of four different vendors. All three of the 32-applications PC WorldBench uses are from a single vendor (Microsoft).
○ ZD's PC Benchmarks CD-ROM which contains Winstone 32, Winstone 96, and WinBench 96 includes everything you need to run the benchmark programs, including the applications Winstone 96 runs during a test.	○ With PC WorldBench, you have to own or buy the necessary applications and install them yourself.
○ Winstone 32 produces an overall score for the PC regardless of the application software installed.	○ With PC WorldBench, if the test PC does not contain all the necessary applications, you can't get an overall score.
○ With Winstone 32 or Winstone 96, if you want more information on why a system performs as it does or if you notice an anomaly or a problem with a system. WinBench 96's subsystem tests can help you find the particular component causing the problem.	○ PC WorldBench provides only applications and overall scores for a PC: it does not provide any subsystem-level tests. Thus, you have no way to go more technical information on a systems performance or investigate problems its experiencing.
○ You don't have to do any special application setup to run Winstone 32. With both Winstone 32 and Winstone 96, the installation and setup programs do everything for you. So, you can count on accurate and repeatable results, because the applications Winstone 32 and Winstone 96 run will be set up the same way on each test system.	○ With PC WorldBench, you have no way of knowing how the *PC World* Test Center set up applications on its test systems for its reviews. Even if you have the necessary applications to run the program installed on the test system, you can't guarantee that the setup of these applications matches the *PC World* Test Center's setup. Thus, you won't be able to accurately compare your scores with scores *PC World* has published.
○ To determine which applications to use in both Winstone 32 and Winstone 96, ZD consulted with Computer Intelligence InfoCorp (CII), a leading market research company (and another division of ZD). We chose the business applications that were the market leaders and were available when our development on these benchmark programs began. For Winstone 32, we similarly determined the 32-bit business application market leaders.	○ In their press release and articles regarding PC WorldBench, *PC World* did not disclose how they chose the applications the benchmark program uses.
○ Multiple ZD publications around the world use the PC benchmark testing team to measure PC performance.	○ Only one publication, *PC World*, uses PC WorldBench.
○ ZD publications review hundreds of machines using Winstone 32 and other ZD PC benchmarks for their comparative reviews. *PC Magazine* alone reviewed 101 machines for their Spring COMDEX issue.	○ *PC World* reviewed 20 machines for their PC WorldBench debut issue in March.

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can expect to find most of them in the future versions of the operating system. (None currently come with Microsoft's Service Pak.) Some are Taskbar icons that let you perform feats like changing Windows' screen resolution and color depth without rebooting. Others add features to the context menu in Windows Explorer so you can access a list of files in a folder without opening a folder window. Another lets you print HyperText Markup Language documents directly from many applications, complete with graphics.



The TweakUI applet in PowerToys controls otherwise inaccessible features of the Windows interface.

TWEAK TIME

The most valuable of the PowerToys is a Control Panel applet called TweakUI. This gives you access to controls that otherwise require complex fiddling with the registry. It lets you: change the speed at which menus fly out of the Start Menu; turn off "exploding" windows; stop Windows from adding the words "Shortcut to" whenever you create a shortcut; and change the arrow on shortcut icons to a smaller, less obtrusive one than the default.

If you want to turn a document into a template that's listed on the New menu, just drag its filename into a panel in one of TweakUI's tabbed pages. Other settings in the applet let you hide or create desktop icons like Network Neighborhood and The Microsoft Network, while still others let you control the way Windows boots up without modifying the hidden MSDOS.SYS file by hand.

POWER TOOLS

The programs that run as Taskbar icons consists of QuickRes, which is used for changing screen dimensions and depth on the fly; AutoCD, which lets you run applications from any non-audio CD-ROM as soon as you insert the disk (even if the disk doesn't support Windows 95's AutoPlay feature); FlexiCD, a miniature audio CD control panel that can automatically resume playing a CD after you reboot; and a Telephony Location Selector that lets mobile users change their dialing location from an icon.

Additions to the Explorer context menu include the Contents command that pops up a list of files so you can launch applications or load files without opening a folder window; the Explore from Here command that opens a two-pane Explorer window with the current directory displayed as the root directory, so you don't have to sort through a full list of drives and folders; CabView, which displays the contents of Microsoft's compressed "cabinet" files (found on the Windows 95 installation disks and CD-ROM) as if they were directories and lets you drag files out of them; and Target, which lets you perform file management operations on the file to which a shortcut points without searching for the file on your disk.

Miscellaneous programs include a replacement clock program that appears as a round window with no square border. The program also automatically makes whatever window is under the mouse pointer the active window.

The PowerToy that lets you print HTML files from almost any application is a printer driver that "prints" to HTML files. It converts bitmaps to JPEG images and performs some rudimentary parsing to create standard HTML headings and tables, but you'll have to edit the resulting files to get the layout you want.

All these applets are compact, reliable, and compatible. Unless you're not running Windows 95, you'll find a use for PowerToys.—*EM*

PowerToys. List price: free. Requires: 386 CPU, 4MB RAM, 1MB hard disk space, Microsoft Windows 95. Microsoft Corp., Redmond, WA.
(Indian subsidiary Microsoft India, New Delhi; Indian partners Datapro Infoworld, Pune; Godrej Trading, Bombay; Sonata, Bangalore; TUL, Bombay.)

XSOFT (DIVISION OF XEROX)

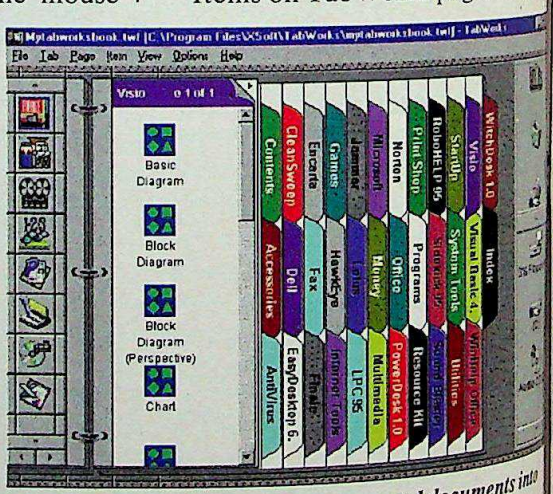
TabWorks

Under Windows 3.1, XSoft's TabWorks offered an appealing alternative to Program Manager. Under Windows 95, TabWorks 2.0 is a utility looking for a reason to exist.

TabWorks ($49) uses a tabbed notebook as its metaphor. You can organize applications and documents into notebook pages, and a colored tab marks each page. Clicking the tabs, arrayed either vertically on the book's right side or horizontally below, takes you from page to page. You can also navigate with PgDn and PgUp or by clicking a dog-ear flap in a page's upper-right corner. TabWorks automatically adds contents and index pages which also serve as navigational tools.

Double-clicking icons on notebook pages lets you open programs and documents. For more direct access to the items you use most, you can copy icons to a button strip that appears to the left of the notebook pages. On an 800- by 600-pixel screen, you'll have room here for almost all of your favorite items. Along the right edge of the window, meanwhile, TabWorks populates a "tool area" with handy drag and drop targets: the current default printer, the Recycle Bin, and icons for each local drive and mapped network server.

Items on TabWorks pages are pointers, not actual executables or documents, so you can copy them onto multiple pages without wasting storage. You can create a notebook page for each project you're currently working on, and copy to that page whatever programs and files you need. When you've completed the project, you just delete the page.



TabWorks organizes your programs and documents into notebook pages with named tabs.

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Bringing Together

DATTARAM-12596

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If you think all this makes TabWorks sound like a super Program Manager, you're right. If you still use Windows 3.1, you might want to consider replacing the standard shell with TabWorks. (XSoft includes Windows 3.1 and Windows 95 versions in the same box.) But under Windows 95, TabWorks seriously disappointed us.

Other than allowing long filenames along with UNC paths and implementing the Recycle Bin as a drag target, TabWorks barely supports the new capabilities of Windows 95. The utility includes a command to convert your Programs folders to notebook pages. But this command ignores folders nested below the top level of your Programs menu. And because XSoft patterned the structure of a TabWorks notebook after the flat-file Program Manager, you can't nest pages by hand.

Dragging documents to the printer icon works fine, but if you want to change the default printer or drag to a nondefault printer, TabWorks won't help you. Nor will it do anything to streamline your access to any part of Control Panel. (Why aren't the Control Panel and Printers folders included in that tool area?) And if you use one of the utility's document-tracking features (which automatically adds newly created documents to the current notebook page), TabWorks clumsily creates a new page item for every file you *delete*, because deletions cause Windows to create new files in the Recycle Bin. XSoft is working on a fix for this.

Although items on notebook pages are shortcuts, TabWorks doesn't show the shortcut arrows on their icons, a mismatch with the standard Windows 95 UI that will irritate some users. And if you drag a shortcut from your desktop to a notebook, TabWorks may claim to move the item, but it just creates a copy. XSoft touts the new password capability as a way to protect your sensitive documents, but this feature does nothing to inhibit access via the standard Windows 95 shell. The bottom line: TabWorks solves problems that no longer need solving.—*CS*

TabWorks 2.0. Estimated street price: $49. Requires: 386 PC or better, 4MB RAM, 12MB hard disk space, Microsoft Windows 3.1 or later. XSoft (a division of Xerox), Palo Alto, CA.

(No Indian partner.)

WITCHDESK INC.

WitchDesk 1.0

Did someone delete the "personal" from your personal computer? WitchDesk thinks so, and offers WitchDesk 1.0, delivered on CD-ROM only, as the remedy. WitchDesk lets you personalize your Windows 95 user interface by draping your desktop with live wallpaper. (A separate version supports OS/2 Warp, but no version is available for Windows 3.1.) With WitchDesk in place, you double-click areas of the wallpaper to launch programs.

WitchDesk comes with more than 1,700 photographic images, including a number of attractive travel scenes, suitable for use on systems with 256 or more colors. You can make any of these a starting point for your WitchDesk UI, or you can apply any of your own full-screen images.



WitchDesk lets you personalize your user interface by covering a wallpaper scene with program-launching hot zones.

Once you've got your backdrop in place, you can use simple clicks and drags to turn it into a functioning launch pad. Four kinds of objects can serve as hot zones: smaller graphic images laid over the backdrop, text blocks, portions of the backdrop that you simply designate as hot spots, and standard Windows shortcuts (which WitchDesk, perplexingly, displays without their shortcut arrows). Using self-explanatory dialog boxes, you can add bubble help to any WitchDesk-created hotspot (other than a Windows shortcut).

WitchDesk normally fills the entire screen, save for the task bar. To drag your desktop shortcuts into the scene, or to access the desktop property sheet, you can toggle into a windowed mode. The Start menu and task bar remain visible while WitchDesk is running, allowing you to switch programs in the conventional manner and access items on your Start menu.

Hot zones on the WitchDesk scene are not limited to opening programs and documents. They can also invoke macros (written in WitchDesk's editable scripting language or recorded with the program's supplied "wizard maker"), switch to a different WitchDesk scene, return to the scene from which the current scene was called, quit WitchDesk, or even exit from Windows. Because you can associate sound and video clips with hot zones, WitchDesk can serve as an inexpensive multimedia authoring system, suitable for screen-running demos, kiosk applications, and such. The program even includes a service-level bitmap editor.

Unfortunately, we ran into a big bug when we tested WitchDesk 1.0. On two separate computers, two of our programs invariably generated general protection faults whenever they were terminated while WitchDesk was running. In the case of one of these programs, the GPF always brought Windows itself to a halt, with potential loss of work and damage to open files. A spokesperson said WitchDesk was looking into the problem.

We also experienced problems with the macro recorder. In repeated trials, the recorder failed to play back keystrokes and mouse actions correctly. (In playback of a keyboard-only recording, for example, Ctrl-Esc inexplicably opened an item setting on the task bar instead of invoking the Start menu.) WitchDesk said an improved version of the macro recorder should be ready by the time you read this. Lastly, the version shipped to us, we found dialog boxes half in German, German scripting keywords, and a very crudely translated user guide. In the end WitchDesk, though innovative and promising, comes across as not quite fully baked.—*CS* n

WitchDesk 1.0. List price: $49.95. Requires 386-based PC or better, 4MB RAM, 14MB hard disk space (22MB required for all 1,700 images), 2X CD-ROM drive, Microsoft Windows 95. WitchDesk Inc., San Jose, CA

(No Indian partner.)

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UNINSTALLERS

REMOVING APPLICATIONS BY HAND IS TEDIOUS, AND IT'S HARD TO FIND ALL THOSE DLLS. UNINSTALLERS OFFER AN ESCAPE HATCH, MAKING APPLICATION REMOVAL ALMOST SIMPLE.

By Edward Mendelson

Your hard disk is littered with files left over from programs you no longer use, or old versions of programs you've since upgraded. Uninstaller utilities are designed to clear out unwanted applications, needless entries in the Windows Registry and .INI files, and miscellaneous files that do nothing but take up space on your disk. All these utilities come with the risk that they'll remove files and Registry entries that you actually need, but they vary greatly in their levels of risk.

The original uninstaller was MicroHelp's UnInstaller, and it has now been joined by Quarterdeck's CleanSweep and Vertisoft's Remove-It. With all three, the main purpose is to remove applications by clearing out the application program itself, dynamic link library files (DLLs) and Visual Basic Extensions (VBXs) used only by the application and not shared with other Windows programs, and miscellaneous .INI files. The packages will optionally search for and destroy data files created by these programs. Each package can also archive applications and related files for later use, or help you move them between drives or computers.

The current generation of uninstallers isn't smart enough to know whether many of the DLL files in your Windows folder are essential or expendable. Some of these files are required by third-party hardware drivers and applications. CleanSweep and Remove-It both list "orphan" DLL files for possible removal (with a yellow caution light). UnInstaller 3 avoids this problem by not listing orphan DLL files unless you add an undocumented entry to the Windows Registry.

Windows 95 introduced a built-in uninstall feature, which you can find in the Control Panel's Add/Remove Software applet. The quality of this feature varies with individual software vendors, and the applet will often prompt you to remove an orphan DLL file that may in fact be required by another program. You'll generally find better results if you track an installation with the monitor programs that come with each of the application-removal utilities, and then use the utility to remove a program.

Uninstallers should be used with caution. The faster and most efficient removers are also the riskiest, and you need to find the balance between speed, thoroughness, and safety that best suits your needs.

QUARTERDECK CORP.

CleanSweep 95

ALL REVIEWS BY EDWARD MENDELSON

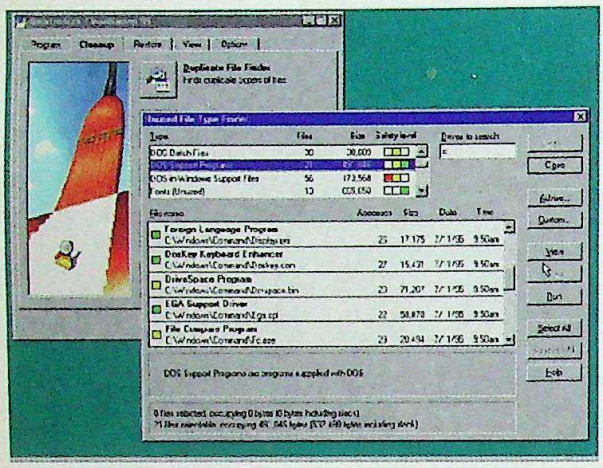
Among all application-removal software, Quarterdeck's $29.95 CleanSweep 95 is the easiest, generally the fastest, and the only one that tells you exactly what it plans to do to your system when it removes an application. Versions for Windows 3.*x* and Windows 95 come in the same package.

CleanSweep removes applications and unused orphan files; it tracks installations for accurate removal later; it compresses applications into archives for re-use at a

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later time; and it moves programs between drives on your computer or to another computer. Unlike its rivals, when you perform any operation, CleanSweep gives you the option of viewing every detail of the changes it proposes to make to the fragile Windows 95 Registry and lets you decide what changes you want to accept.



CleanSweep 95 lets you view files before deleting them, and, where appropriate, lists connected files.

In standard application removals, it doesn't always list every expendable file, but it generally errs on the side of safety. In one test, it seriously damaged the Windows Registry, although Quarterdeck fixed this problem after we reported it.

When you launch CleanSweep, it rapidly scans your drive to record applications and links among them. The well-organized Uninstall dialog lets you choose among programs installed by CleanSweep's background installation monitor, or programs that the monitor didn't track, and it lets you remove either full Start menu groups or separate applications. The program then scans the selected application for links and checks its database of standard applications to find related files that it didn't detect by scanning. This database isn't as up-to-date as the ones in rival programs—it lacks the Windows 95 version of Visio—and you can't examine or change it. A Restore module easily brings back all or part of any program that you chose to back up during removal, and the program prompts you to discard old backup files after a user-selected interval.

A Cleanup dialog offers to remove duplicate files, unused DLL and VBX files, and discardable files like backups, DOS batch files, screen-savers, and other space wasters. The lists of orphaned DLLs and applications over-aggressively include files used by Windows' fax software and other parts of Microsoft Exchange, the QuickTime viewer, the Microsoft Network, and the INI file for Adobe Type Manager. The list of backup files includes anything in a directory named BACKUP, so it lists as potentially removable the backup software that Adaptec's EZ-SCSI package stores in a directory by that name. Fortunately, the program puts a yellow "caution" light next to all files in the orphans, backups, and most other lists, but you have to choose deletions explicitly.

CleanSweep gives you the option to install two background programs, one to monitor installations on the fly, the other to locate files that haven't been used recently.

On our tests with the Lotus Notes 4.0 32-bit client, the monitor reported that Notes had installed a Registry key named HKEY_LOCAL_MACHINE\Software, even though this crucial key already existed and contained all the information that Windows needs about installed software. When we used CleanSweep to remove Notes, it wiped out the entire key—a disastrous step that we fixed by restoring from CleanSweep's backup. After we reported these problems, Quarterdeck posted a patch on its Web site and shipped it to all registered users. The fixes have since been incorporated in Version 2.03.

CleanSweep's uniquely detailed reporting may make it the only acceptable application remover for expert users. And less- experienced users will find it effective and efficient if they use it with caution.

CleanSweep 95. Estimated street price: $29.95. Requires: 386-based PC or better, 4MB RAM, 5MB hard disk space, Microsoft Windows 95. Quarterdeck Corp., Marina del Rey, CA. *(Indian partner Unison Computer Systems, 164 Senapati Bhapat Marg, Matunga (WR), Bombay 400016. Tel : 4374671; Fax: 4376265.)*

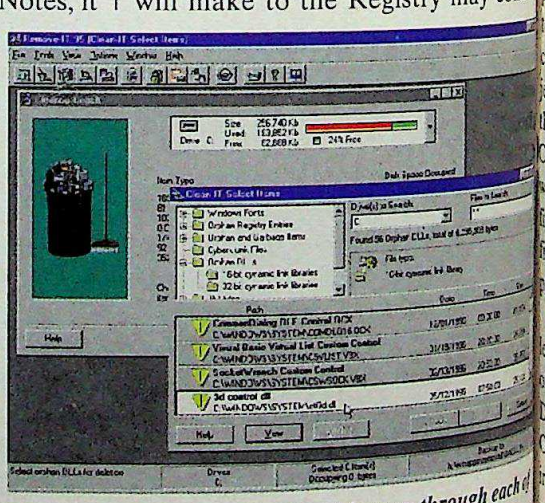
VERTISOFT SYSTEMS INC.

Remove-It 95

Vertisoft's $69.95 Remove-It 95 clean out unused sections of the Windows Registry that other application-remover programs don't even notice, and it includes a unique clean-up wizard that guides beginners and experts through the whole sometimes-complex process of removing unneeded files.

This package, which ships with both 16- and 32-bit versions, includes standard functions: It tracks installations, removes applications whether it tracked them or not, archives applications for later use, and transports programs from one computer to another—with the unique ability to install the program on the other computer even if Remove-It itself is not installed there. In ordinary application removals, Remove-It ferrets out unneeded files that other programs don't notice, but it doesn't tell you exactly what changes it proposes to make to the Windows Registry.

Remove-It scans your disk quickly when you launch it, then scans the Start Menu and desktop when you launch its application-removal module. A clear series of menus walks you through the removal process, although the lack of any details about changes that the program will make to the Registry may concern users. You can choose to remove logged installations, other programs installed under Windows, or programs without Windows icons. Many of these icon-less programs are essential to Windows, and Remove-It pops up a stern warning before letting you remove them.



Remove-It's Cleanup Coach guides you through each of the program's modules.

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Room for improvement

If you installed all your applications to one directory without placing any DLLs, VBXs, or OLE links anyplace else—and didn't lay a hand on your Windows 95 Registry—then these uninstallers would have an easy job at their hands. But the truth is that uninstalling is risky business.

All three uninstallers have their merits and their deficits, yet none of them truly unwraps the uninstallation enigma to our satisfaction. As a result, none of them deserve our Editors' Choice. How, then, do you choose? It really depends on your tolerance for risk.

The most promising of the three apps we looked at is also the riskiest. Quarterdeck's CleanSweep 95 gives you opportunities to backup whatever you plan on removing, but its aggressiveness gives us pause. On our tests, it removed critical information from the Registry, which we eventually recovered using CleanSweep's own restore tool (Quarterdeck has since fixed this problem). On the other hand, no other uninstaller did a better job of removing unwanted applications and finding duplicate files. And its excellent reporting makes it even safer for expert users.

MicroHelp's UnInstaller 3 also deserves praise for its effectiveness, but its philosophy leans heavily toward caution, so it ultimately leaves more files hanging around than you might want. Vertisoft's Remove-It 95 is capable but not as intelligent as the other two at removing files that you might need later, such as references to OLE objects that may actually exist on removable media such as CD-ROMs.

PC MAGAZINE EDITORS' CHOICE

As first-generation Windows 95 applications, all three hold promise, but none offers the kind of intelligence necessary to help you figure out what DLLs are critical, or to notice if you accidentally selected a critical file, such as a hardware driver, for removal.

Remove-It scans applications you want to discard, and checks its large database of standard applications for related files that it can't find by scanning. Expert users can examine this database with a file viewer, but can't customize it.

An INI file editor lets you remove or modify entries, but not add new ones. The cleanup module does an impressive job of finding unused Registry data, but don't believe every green light that the program places next to items that it considers safe to remove. Remove-It tells you that you can safely remove references to OLE objects that it can't find—but it can't find them because they exist on multimedia CD-ROM disks that aren't in the drive when Remove-It is looking. Vertisoft fixed this after we reported it, and a patch file is available on Vertisoft's CompuServe and America Online forums.

Vertisoft also vowed to fix other problems we detected, including its inclusion of many commonly-used DLLs in the list of orphans. On our test system, this list included the Visual Basic 4.0 run-time files required by many applications on our system, the DLLs used by Hewlett-Packard's ScanJet software, Apple's QuickTime movie player, parts of Microsoft Office, and all the backup software that Adaptec's EZ-SCSI stores in a BACKUP file. After we alerted Verisoft of these specific DLL problems, the company released a fix which leaves out these DLLs.

Remove-It's installation monitor is slower than CleanSweep's because it stores a list of all your files and all your Registry entries before and after an installation, and it compares them in order to produce its report. This method is safe but frustratingly slow, and the monitor's reports, which are buried deep in the reporting module of the main program, do not include any details about recorded changes to the Registry or .INI files. Vertisoft should have fixed this by the time you read this. You can start the monitor at any time to record changes to your system. A second monitor program keeps track of files and applications that are rarely used, and comes in handy only if you know that you won't need older files.

Remove-It boasts the widest range of features of any application-remover. Expert users will prefer the more detailed reporting in CleanSweep 95, but other users will find it an effective way to remove old applications if they treat its lists of removable files with extreme caution.

Remove-It 95. List price: $69.95. Requires: 386DX-based PC or better, 4MB RAM, 4MB hard disk space, Microsoft Windows 95. Vertisoft Systems Inc., San Francisco, CA.

(No Indian partner.)

MICROHELP

UnInstaller 3

In its third version, MicroHelp's $39.95 UnInstaller has implemented lessons learned that rival packages have hardly heard about. The least aggressive program of its kind, trusty UnInstaller 3 makes damaging your system while trying to regain disk space very difficult.

UnInstaller deliberately avoids the more risky feats attempted by other packages so that you'll spend less time undoing inadvertent damage. It reliably removes and archives applications, and it lets you move them to another drive or to another computer that also has a copy of UnInstaller.

UnInstaller also helps you remove files that Win-

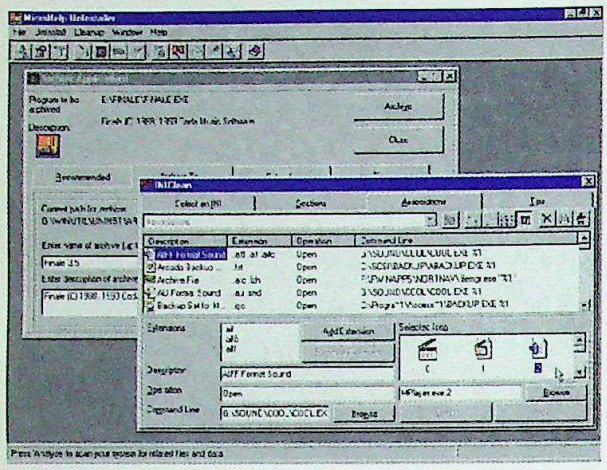
Uninstallers

m YES NO

Products listed in alphabetical order	CleanSweep 95	Remove-It 95	UnInstaller 3
Background installation tracking	m	m	
Installation tracking on command	m	m	m
Backs up when removing files	m	m	m
Moves applications between drives	m	m	m
Moves applications between PCs	m	m	m
Creates self-installing files		m	
Finds duplicate files	m	m	m
Fully edits .INI files		m	m
Prompts to remove backup files	m		

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UnInstaller 3 lets you edit file associations and INI files in one window while removing applications in another.

dows unquestionably doesn't need—such as help files, fonts, multimedia files, and duplicate files—and it lets you confirm that you're removing only a true duplicate, not simply a file with the same name and size as another. It lists orphan applications, but instead of giving you the dangerous option of deleting them, it offers to reinstall them into the Start Menu.

PLAYIN' IT SAFE

When you start UnInstaller, it presents you with a mostly blank window, and you select one of the program's modules from the top-line menu or a toolbar. The first time you want to delete, move, or archive an application, UnInstaller prompts you to let it build or update its SmartLinks database of applications and linked files. Although this scanning operation takes more time than the startup scans of rival utilities, it deliberately produces less complete results. For example, in a test removal of parts of Spry Internet Office, both Remove-It and CleanSweep listed an .INI file that UnInstaller didn't list, although the program could have safely removed the file.

With UnInstaller, you can remove only one application at a time—a limitation that will inconvenience some users and rescue others from unintended disasters. The program doesn't describe in detail the changes it plans to make in the Registry, and advanced users may hesitate to accept these changes on faith. MicroHelp promises improved reporting in a future version.

A SHORTER LIST

UnInstaller's cleanup module lists discardable mulitimedia files, help files, and other categories that can safely be removed, and unlike both Remove-It and CleanSweep, it won't list backup software among your removable backup files. The list of orphan files lists only executable files, not DLLs, and if you want to remove any of the orphans you find, you have to go to Windows Explorer or the DOS command line and do it yourself. Earlier versions of UnInstaller pioneered the orphan-removal feature, but MicroHelp removed it after too many users removed essential files. If you want to bring back the orphan-removal function and add DLLs to the list of orphans displayed, make this undocumented change to the Windows Registry. Under HKEY_CURRENT_USER\Software\MicroHelp\UnInstaller\3.5\Options, add the string value "PowerOrphans" with the value "1."

Other cleanup features include a well-designed .INI file editor. A file-associations editor lets you view and modify the associations between file extensions and applications; this proved more usable and clear than the similar editor in Windows Explorer. Both 16-bit and Windows 95 versions come in the same package.

Except for its weak reporting, UnInstaller is without a doubt the safest of the application removers.

Except for its weak reporting, UnInstaller is by far the safest of the application removers. It leaves Registry entries and files that other programs remove, but it doesn't do any harm by leaving them, and you risk harm by removing them.

UnInstaller 3. Estimated street price: $39.95. Requires: 386-based PC or better, 4MB RAM, 5MB hard disk space, Microsoft Windows 95. MicroHelp, Marietta GA.

(No Indian partner.)

While we offer you the best, we can do still better, if you send us your comments on the magazine.

Write to

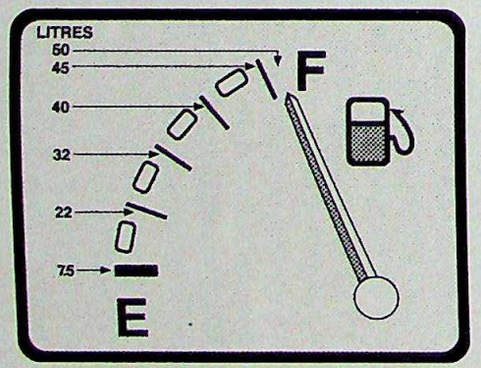
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DCM DAEWOO MOTORS

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DCM DAEWOO MOTORS

GAUGE THE CIELO. YOURSELF.



FUEL AVAILABLE IN TANK

There are two ways of gauging a car. One is through hearsay. The other is through facts that are here. Contrary to rumours floated by vested interests, the Cielo does not guzzle fuel (as ample proof, we have 6,000 very satisfied buyers in India in only six months and, since its international launch about a year ago, over 200,000 buyers worldwide). And before you begin to read very much into the matter, we suggest you read the Cielo's fuel gauge carefully. You see, the markings on the gauge are not in linear proportion. The diagram alongside bears that out. Which means that even when the needle drops to the fourth level from the top, there's still a good 22 litres, out of a total capacity of 50, of fuel in the car. However, the proof of the pudding is in the eating. So we'd only be too glad to conduct a fuel-efficiency test in front of your own eyes. Indeed, previous tests have shown that the Cielo, India's only car with Multi-point Fuel Injection System for optimum fuel utilisation, covers 12-14 kms per litre in city driving conditions and appreciably more on highways. Contact any of our dealers and put the Cielo to the test. Please do it for one very simple reason. Yourself.



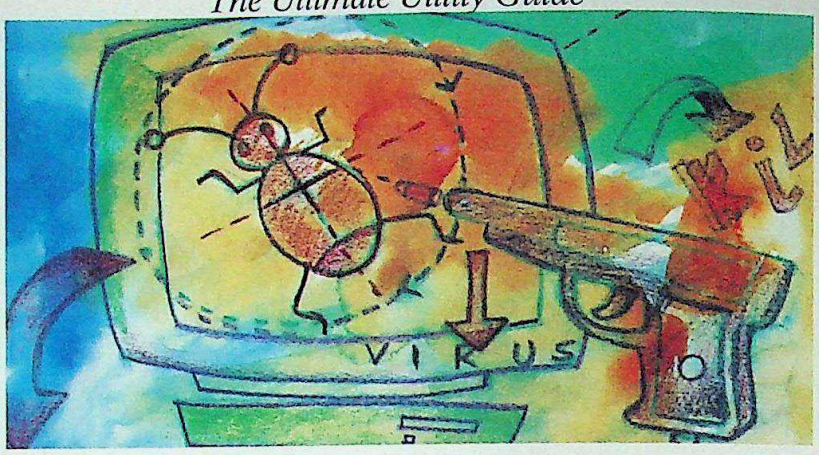
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ANTIVIRUS UTILITIES

MISSING FROM WINDOWS 95'S COLLECTION OF UTILITIES IS AN ANTIVIRUS TOOL. FOR THE ULTIMATE IN VIRUS PROTECTION, CHOOSE FROM AMONG THESE NINE EFFECTIVE CONTENDERS.

By Keith Schultz

The 32-bit Windows 95 was designed to run older, 16-bit applications without any problems. That was good news for us, and it was good news for virus authors, too.

Windows 95, and all of its associated support programs and files, is just as vulnerable to virus attack as were DOS 6.2 and Windows 3.*x*. And with more and more people connecting every day to the Internet and other online services, the risk of infection increases even more. What we need now are new programs to help us keep our systems clean, warn us of possible danger, take advantage of the new operating system, and protect us from new breeds of 32-bit viruses such as the Word Concept macro virus and the recently discovered 32-bit Boza. Here we evaluate nine such packages. All offer direct support for Windows 95 or, at least, 32-bit engines.

Designers of antivirus utilities faced significant hurdles in their efforts to upgrade their programs to full Windows 95 compatibility. They had to deal with long filenames, compatibility problems with terminate-and-stay-resident (TSR) programs, and a significant change in the way the system accesses boot sectors of floppy disks. These major system changes forced near rewrites of all of the code to true 32-bit engines. Most of the software companies were up to the task, but only some can claim success.

No one program in this evaluation covers *e very* feature we were looking for, but a couple come close. Prevention, detection, virus removal, performance, integration, and administration comprise the key components in antivirus software, and if any one of these features is missing, the product simply isn't complete—so you'll have to look for the one program that meets your needs the most.

Virus detection was a very important aspect of our testing, but not the only part. (If that were true, then a DOS-based scanner would be your antivirus tool choice.) We also looked at the use of v tual device drivers (VxD) for real-ti protection and tight integration with W dows 95's user interface.

Another key feature is the ability to n tify others in your workgroup of a virus i fection. But your software must have stro administrative abilities for virus protecti across a LAN, so see our section on n worked antivirus tools for further coverag

S&S SOFTWARE INTERNATIONAL INC.

Dr. Solomon's Anti-Virus Toolkit

ALL REVIEWS BY KEITH SCHULTZ

Dr. Solomon's Anti-Virus Toolkit ($1 nearly hits the bull's-eye as a Windows virus scanner. This seventh version tak advantage of some Windows 95 featur such as the Taskbar and Explorer. It w even scan inside zipped files, albeit slo ly. On our detection tests, Dr. Solomo fell just behind the top three products detecting our in-the-wild viruses, but had some trouble repairing the infect files. Dr. Solomon's is also available versions for DOS, NetWare, OS/2, Windows NT.

To detect viruses, Dr. Solomon's t

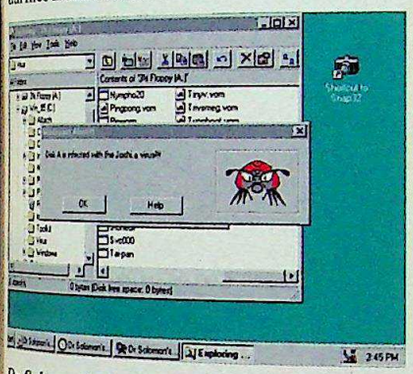
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a mix of signature matching and checksumming, FindVirus, Dr. Solomon's virus scanner, will also run with a heuristic option that lets it look inside files for new virus code combinations.

WinGuard provides real-time protection for your system. The WinGuard module, which is based on a 32-bit virtual device driver (VxD), monitors all drives in the system during file reads and writes. WinGuard correctly identified boot-sector viruses on an infected floppy disk and successfully blocked infected file copies to and from our test system, even across the network.

Dr. Solomon's Anti-Virus Toolkit can check for viruses inside archives made with most common file archivers, including PKZIP and ARJ. If you choose to do this, expect your scan times to increase dramatically. You can scan your system or individual files from either the main menu or from



Dr. Solomon's Anti-Virus Toolkit alerted us to a boot-sector infection on our floppy disk.

the Windows Explorer. To help simplify your virus scans, Dr. Solomon's includes a very flexible program scheduler: Simply choose the time and day for the scans, as well as when to repeat the scan. Dr. Solomon's also detects and removes the Word Concept macro virus.

File-repair functions in Dr. Solomon's Anti-Virus Toolkit go no further than renaming or deleting irreparable infected files. Unfortunately, you cannot attempt to repair on a file-by-file basis. To disinfect, you must scan the entire drive.

Dr. Solomon's includes weakly implemented activity logging and offers no provisions for e-mail or other means of notification. But the product's first-rate documentation includes the 268-page Virus Encyclopedia—also available on disk and updated on S&S's Web page—which makes up-to-date material on viruses possible.

Norton AntiVirus for Windows 95
Norton AntiVirus for NetWare

The Chicken Little predictions of 8,500 known viruses attacking your PC have not come to pass—and they probably never will. But for the 200 or so that truly exist in the wild, no better desktop protection exists today than our Editors' Choice, Symantec Corp.'s Norton AntiVirus for Windows 95. Symantec's Norton AntiVirus for NetWare Version 2.0 receives our Editors' Choice for networked antivirus protection.

PC MAGAZINE EDITORS' CHOICE

Norton AntiVirus, the most consistent of the products we tested, made excellent use of Windows 95's features and detected nearly every virus we threw at it. A highly customizable utility, Norton AntiVirus also makes very effective use of Windows 95's tabbed dialog box metaphor.

Though DOS-based TSRs have proved effective at detecting viruses, they don't always work under Windows 95. As a result, Norton AntiVirus uses a VxD (Auto-Protect) for real-time signature scanning. Scanning inbound and outbound files, along with all inserted media, Auto-Protect caught 100 percent of our boot-sector and file-based viruses and let only two polymorphic viruses slide. Norton AntiVirus can also detect viruses in .ZIP files. We were also pleased to find that the utility could detect *and remove* the Word Concept macro virus.

Is there any room for improvement here? Sure. Norton AntiVirus could offer users more control when they use the AutoProtect module. Currently, you can't make the module scan a particular directory or file.

Command Software Systems' F-Prot Professional for Windows 95 deserves honorable mention here. Although it lacks the smooth Windows 95 integration of Norton AntiVirus, it was virtually unbeatable when it came to virus detection.

Ultimately, Dr. Solomon's Anti-Virus Toolkit has emerged as a solid antivirus product for Windows 95, with first-rate detection that is only slightly hindered by its lack of file-cleaning abilities.

Dr. Solomon's Anti-Virus Toolkit. List price: $125 (includes four quarterly updates). Requires: 386-based PC or better, 4MB RAM, 10MB hard disk space, Microsoft Windows 95. S&S Software International Inc., Burlington, MA.

(No Indian partner.)

COMMAND SOFTWARE SYSTEMS

F-Prot Professional for Windows 95

F-Prot Professional for Windows 95 ($169.90), from Command Software Systems, builds on an already good reputation by upgrading to a new 32-bit engine. Although F-Prot doesn't take full advantage of Windows 95, it does offer excellent protection from virus attack. In fact, F-Prot's virus detection bested all others on our in-the-wild virus tests.

A new virtual device driver (VxD) comprises the heart of F-Prot's real-time protection. F-Agent is responsible for the detection of viruses on inbound and outbound files and also checks files on access. Configuration options range from what action to take when F-Agent detects an infected file to whether to scan the complete memory area for viruses. We tried to copy an infected file from another Windows 95 PC to our test machine, and F-Agent stopped the file transfer before the file made it to the hard disk. F-Prot also catches the Word Concept virus but cannot remove it as yet.

When you want to scan a specific drive or folder, you must create or modify a task to accomplish this. Also, unlike with PC-cillin and VirusScan, you can't initiate a scan from the Windows Explorer. For

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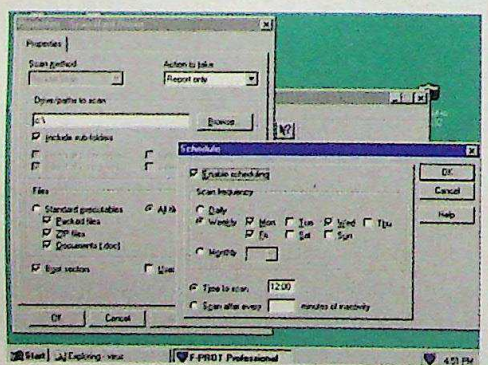
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Antivirus Software

■ YES ■ NO Products listed in alphabetical order	Dr Solomon's Anti-Virus Toolkit	F-Prot Professional for Windows 95	IBM AntiVirus Desktop Edition	Integrity Master	Norton AntiVirus for Windows 95 (PC MAGAZINE EDITORS' CHOICE)	PC-cillin 95	ThunderByte Anti-Virus Utilities for Windows 95	Virus Alert	VirusScan for Windows 95
Install creates rescue disk by default		■			■	■			
Includes native uninstall feature							■		■
Install program scans memory prior to installation		■			■	■	■		■
Scans boot sector	■	■	■	■	■	■	■	■	■
Can restore master boot record	■	■	■	■	■	■	■	■	■
Can restore partition table	■	■	■	■	■	■	■	■	■
Scans compressed files	■	■	■		■	■		■	■
Scans memory	■	■	■	■	■	■	■	■	■
Can schedule automatic scans	■	■	■		■	■			
Reports scan results on screen/file log	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Includes innoculation feature	■		■	■	■		■		
Can scan inbound/outbound files	■ ■	■ ■	■		■ ■	■ ■	■ ■		■ ■
Scans files on access	■	■	■		■	■	■		■
Detects/removes Word macro viruses	■ ■	■	■	■	■ ■		■	■	■
Virus list updates are available via BBS/Internet	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■

each task you create, you can choose what types of files to scan. This allows you to have one task defined for a scheduled scan and another for a quick check.

F-Prot showed more agility than most of the other programs with file disinfection. One missing option, though, is the ability to move infected files to a safe location so that you can review them later. Administration constitutes a weak spot in this otherwise fine product. Once F-Prot completes a scan and you close the activity log, you cannot go back and review it. You can save the log, but the program doesn't prompt you to do



F-Prot Professional's scheduler lets you set your system to regularly scan for viruses.

so before it's too late. But F-Prot alerts with beeps, and if you're on a network, F-Prot outshines its competition by alerting with an e-mail or broadcast message.

As the most effective virus detective, F-Prot Professional for Windows 95 gets high marks. It will be an even stronger product when it integrates with Windows 95 and adds a few administrative details.

F-Prot Professional for Windows 95. List price: $169.90. Requires: 386-based PC or better, 4MB RAM, 2MB hard disk space, Microsoft Windows 95. Command Software Systems, Jupiter, FL.

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(No Indian partner.)

IBM CORP.

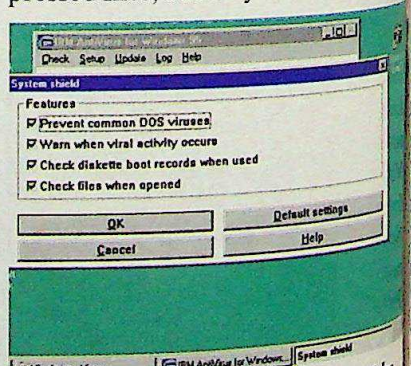
IBM AntiVirus Desktop Edition

IBM Corp.'s IBM AntiVirus Desktop Edition ($49) lacks all of Windows 95's refinements, such as right-mouse-button support and property sheets, and makes no use at all of the Windows Explorer. Its performance was among the slowest in the group. On our detection tests, IBM AntiVirus did well in detecting our in-the-wild viruses, partly because of its fuzzy scanning technology, though its virus-removal functions didn't perform as well.

IBM AntiVirus—which ships with DOS, OS/2, Windows 3.*x*, and Windows 95 versions all in one box—uses a combination of full-signature scanning, change detection, and fuzzy scanning to detect the presence of viruses. Fuzzy scanning flags a file as possibly infected by recognizing a *partial* signature match.

As with VirusScan, the IBM AntiVirus standalone scanner module couldn't read the boot sector of 11 of our infected disks and couldn't find the boot-sector viruses as a result. But System Shield, IBM's real-time scanning module, should be able to detect most diskette-based viruses that the scanner misses, although it missed a few of our boot-sector viruses.

IBM has streamlined the whole scanning process, so you can be up and running quickly. For most, the default options are sufficient. Power users, though, may want a little more control, like the ability to include or exclude drives and file types to scan. IBM AntiVirus will scan inside compressed files, but only those archived with



IBM AntiVirus's System Shield provides real-time protection for virus prevention.

PKZIP or LZEXE. And although it detected the Word Concept macro virus in our test files, it was unable to remove it from the document. A fix should be available by the time you read this.

Like a few other vendors, IBM believes in virus removal from files, but

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Performance Testing: Antivirus Scanners

How We Tested

PC Labs' virus detection tests were performed by the National Computer Security Association (NCSA) and based upon its virus scanner certification process. The NCSA (*www.ncsa.com*) is an independent organization that provides security, reliability, and ethics information and services to the corporate and vendor communities.

Of the estimated 8,500 known viruses, very few are seen outside of testing laboratories; the actual number of viruses *in the wild* is significantly smaller—only 184, according to the February 1996 issue of the WildList, a compendium of virus incident reports from 37 virus industry professionals tracked by Joe Wells, a well-known virus expert. These viruses pose the most significant threat to end users and are the most critical for an antivirus program to identify.

We divided our testing into four parts. First, we scanned one or more files infected with each of the viruses on the WildList. Next, we scanned between 2,000 and 3,000 instances of five wild polymorphic viruses. We then scanned the boot sectors of 75 floppy disks infected with wild viruses. Finally, we scanned over 2,600 files infected with *zoo* viruses—those not actually found in the wild.

When interpreting the results, users should place the most emphasis on the wild viruses. While viruses do occasionally move from the zoo collection to the wild, the move is slow, and antivirus software manufacturers will most likely have updated their signature library to address these viruses before users encounter a problem. Most of the programs also provide additional tools such as integrity checking to identify unknown viruses.

Users should also focus on the results of the polymorphic tests. These viruses are typically more difficult to detect because they change their characteristics with each infection. A program that catches some but not all instances of a particular polymorphic virus gives users a false sense of security and leaves them in a vulnerable position.

Two of the products, IBM AntiVirus and McAfee's VirusScan, were unable to scan 11 of the infected floppy disks because the floppy disks were unreadable using standard DOS calls. This is a dangerous situation: The viruses can still spread if the user accidentally boots from the floppy disk, even if he receives a "non-system diskette" error message. Both companies acknowledge the problem. McAfee will have a fix in an upcoming release. In addition, each product will detect viruses with their real-time protection programs, which reinforces the point that no one protection scheme in any anti-virus program adequately prevents infections.—*Analysis by Ben Z. Gottesman and Dr. Richard Ford*

Each figure reported for a given product represents the number of problems *missed*.

Lower scores represent better performance. Red type denotes an optimal score.

	IN THE WILD (Viruses spreading in the real world)				ZOO (Viruses found only in laboratories)
Out of ▶	File viruses 179 viruses	Polymorphic viruses 5 viruses	Polymorphic replicants 11,190 replicants	Boot-sector viruses 75 viruses	File viruses 2,631 infected files
Dr. Solomon's Anti-Virus Toolkit	0	2	5	0	15
F-Prot Professional	0	0	0	0	45
IBM AntiVirus Desktop Edition	0	3	27	11	66
Integrity Master	6	2	2,002	1	105
Norton AntiVirus 95	0	1	2	0	31
PC-cillin 95	5	3	3,219	0	0
ThunderByte Anti-Virus Utilities	N/A	3	16	0	28
Virus Alert	0	0	0	1	9
VirusScan	0	1	80	11	67

N/A—Not applicable: The product did not complete this test.

found IBM AntiVirus's cleaning abilities somewhat unreliable, since IBM AntiVirus waits until the scan is complete before notifying you of any virus activity. None of the products can clean all infections, but some are better than others: F-Prot and VirusScan successfully removed viruses from files without damaging them.

IBM AntiVirus logs all activity to file and keeps a cumulative log of all scans. Alerting is very basic: It's limited to DOS screens when a file copy is performed, followed by a file copy error message. Also, no support for e-mail or any type of external notification exists.

Ultimately, IBM AntiVirus offers good virus protection but gives modest Windows 95 integration and slow performance.

IBM AntiVirus Desktop Edition. Estimated street price: $49. Requires: 386-based PC or better, 4MB RAM, 2MB hard disk space, Microsoft Windows 95. IBM Corp., IBM AntiVirus Products and Services, Sterling Forest, NY.
(Indian partner TISL, TSIL Tower, Golden Enclave, Airport Road, Bangalore: 560 017. Tel:5262355; Fax: 5268344.)

STILLER RESEARCH

Integrity Master

One of our two DOS-based antivirus programs, the 32-bit Integrity Master, $35 from Stiller Research, does more than just scan for viruses. It detects any form of file corruption, whether caused by virus attack or faulty hardware. The user interface is easy to navigate, and online help is plentiful.

Integrity Master uses a combination of signature matching and file-by-file checksumming to determine if a virus has attacked your system. It then checks the files against the checksum data and investigates those that have changed. Besides keeping track of your files, Integrity Master creates backup images of your system setup area (CMOS) and your hard disk boot sector. In the event of a hard disk error, you can reload the images from a floppy disk to restore the system.

Integrity Master has no real-time file input/output or on-access scan capabilities. To determine if you have a virus infection, you must perform a scan of the hard disk. Note also that Integrity Master focuses on integrity checking, not signature scanning,

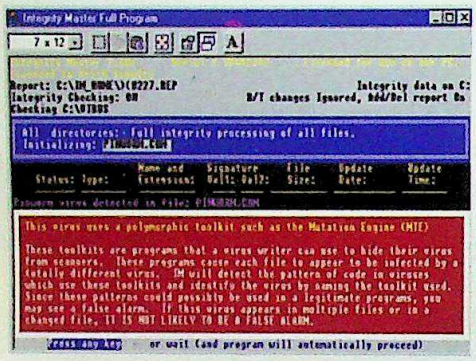
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as its primary means of detection, which could explain its poor performance on our signature-based detection tests.

However, you can easily scan for virus activity with Integrity Master. You have complete control over how Integrity Master checks your system. You can specify which drive or file to scan or set it to scan only the boot sector.

Stiller Research believes that file *deletion* works best with viruses: No virus removal options exist. This new release can detect the Word Concept macro virus, but can't remove it. Integrity Master supplies a wealth of information about the type of virus found, along with possible ways to combat it. And the program sends all data



When Integrity Master detects a virus on your PC, an alert pops up to give you information.

created by the scan process to a log file, including the entire description of the virus and the damage it can inflict.

Integrity Master offers minimal administration features, but this program doesn't require much management. The installation program leaves out the creation of the Integrity Master group and associated icons. You must run a second setup utility to finish out the installation. Note that you can't view the activity logs at all from Integrity Master, but you can open them with any text editor. Unfortunately, the scant alerting limits you to audible tones and red entries in the on-screen activity report.

In the end, Integrity Master doesn't have the flash of a Windows 95 application, but it does hold its own with virus detection and most other forms of files corruption.

Integrity Master. List price: $35. Requires: 8088-based PC or better, 400K RAM, 1MB hard disk space, Microsoft DOS 2.1 or later. Stiller Research, Colorado Springs, CO.

(No Indian partner.)

A New Virus Threat

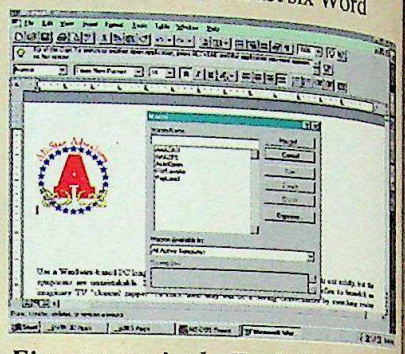
By Ben Z. Gottesman and Keith Schultz

Until last year, viruses were known to attach themselves only to programs and boot sectors. All that changed, however, with the identification of the Word Concept macro virus. Written in Microsoft's WordBasic scripting language, this virus embeds itself within the default document template and replicates to other Word documents: *data files*.

How serious is the threat from macro viruses? As with most virus issues, users should be aware of this new threat, but they needn't panic if they take the proper precautions. On the other hand, macro viruses demand that antivirus software vendors now look inside data files as well as program files—which is likely to slow the scanning process even more.

How quickly a macro virus can spread is subject to debate. However, viruses that infect popular programs such as Word warrant some concern, especially because workgroup computing has increased: Users often attach documents to e-mail messages or put them in a central place such as a BBS or FTP site. These viruses also emerged as the first to infect both PCs and Macintoshes.

At press time, at least six Word



Five macros in the Tools/Macro menu make up the Word.Concept macro virus.

macro viruses have been identified, as well as one for Lotus's Ami Pro, although few have been seen in the wild. Many of the antivirus products reviewed here *detect* the presence of some or all of the Word macro viruses. But with these viruses, disinfection of the document rather than deletion is especially important, and very few products—namely, Dr. Solomon's and Norton AntiVirus—currently do this.

SYMANTEC CORP.

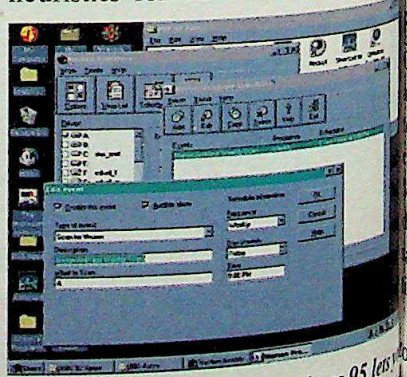
Norton AntiVirus for Windows 95

PC MAGAZINE EDITORS' CHOICE

Norton AntiVirus for Windows 95 from Symantec Corp. was the first antivirus software written for Windows 95, and it takes advantage of many of Windows 95's features. Priced at $79.95, it provides great protection against virus attack. It detected nearly every one of our in-the-wild viruses; moreover, it addresses the newest virus threat: macro viruses.

Norton AntiVirus' real-time scanning module, Auto-Protect, scans files for virus infection when inbound and outbound from your system—disk, network, or modem—as well as upon access. Auto-Protect lets you choose when to scan a file, how to respond to a virus detection, and what files to scan. The superb boot-sector protection detected all boot-sector viruses in our test sample. You can access Auto-Protect at any time by clicking on its icon, located on the Windows 95 Taskbar. can't choose a particular directory or to scan, though.

Norton AntiVirus relies on signatu matching, CRC checksum scanning, heuristics for virus detection. You c



Norton AntiVirus for Windows 95 lets check for viruses at any time, day, or

initiate a scan of a hard disk from the N ton AntiVirus main menu, or you can s a single file simply by browsing for it f

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the Scan menu item. (By dragging the file onto the Norton AntiVirus icon, you can also easily scan a single file.) Norton AntiVirus can also scan files inside a PKZIP archive. In this regard, scanning speed was on par with other products reviewed here. Norton AntiVirus also has an inoculation feature that protects a file from any type of change, intended or unintended.

Norton AntiVirus was able to clean most of our infected file sample, leaving the original file intact. If you choose not to delete the file when Norton AntiVirus detects a virus, it gives the file a .VIR extension and leaves it in the same directory.

Norton AntiVirus's user interface makes good use of Windows 95 tab folders, allowing quick access to all of the available options. The right-mouse-button brings up a context-sensitive help screen. Norton AntiVirus's activity logging, one of the best we've seen, provides extensive filters and print options. But the program limits alert options to a pop-up message or an audible beep when it discovers suspicious activity. You won't find any provisions for pager or e-mail alerts in this product, either. But Symantec promises such support in its summer '96 release of Norton AntiVirus.

Undoubtedly Norton AntiVirus measures up as both a strong Windows 95 application and an exemplary virus detective.

Norton AntiVirus for Windows 95. List price: $79.95. Requires: 386DX-based PC or better, 4MB RAM, 10MB hard disk space, Microsoft Windows 95. Symantec Corp., Cupertino, CA.

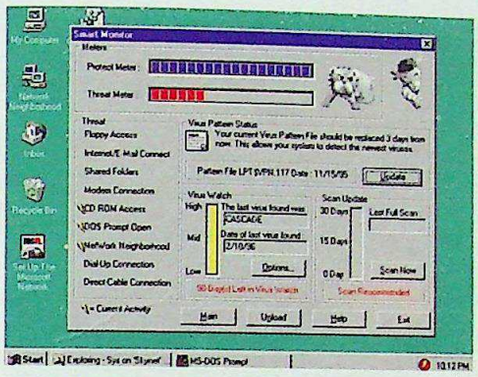
(Indian partners Infosys Technologies, Bangalore; Sonata, Bangalore.)

TOUCHSTONE SOFTWARE CORP.

PC-cillin 95

One of the more visually appealing packages in our roundup, PC-cillin is geared toward the novice user whose needs include ease of use and friendliness. The $49.95 product—which ships DOS, Windows 3.*x*, and Windows 95 versions in the same box—can automate nearly the entire virus protection process for you.

PC-cillin detected all of our boot-sector and zoo viruses but missed five of the common viruses on our tests. Though the version of PC-cillin we tested didn't detect or clean the Word Concept macro virus, a new version (which should be available by the time you read this) will be able to. PC-cillin does search for viruses inside archives compressed with most popular file-compression utilities. Advanced features include automatic scanning of incoming files from BBSs or the Internet (through the serial port) as well as one-touch virus signature upgrades.



PC-cillin's Smart Monitor shows the amount of virus protection and the level of the virus threat.

To identify viruses, PC-cillin uses a combination of signature matching and VICE (Virus Instructional Code Emulator) scanning. Using heuristics, PC-cillin can identify an unknown virus and add the new signature to its virus database. PC-cillin includes Smart Monitor, a module that graphically displays the amount of system protection in use and the level of the virus threat.

You can perform all of your scanning, cleaning, and configuration routines from PC-cillin's main menu. PC-cillin's menu lets you initiate a scan at the drive or folder level, or you can scan directly from the Windows Explorer by clicking your right mouse button. Scanner configuration options in PC-cillin are meager compared with those of Norton AntiVirus or McAfee's VirusScan, and you can't automate the cleaning of infected files.

PC-cillin's real-time protection is good but not complete: It stopped infected files during a file copy to and from our test PC and on access. When we tried to copy an infected file from our test PC to another Windows 95 computer, however, PC-cillin detected the virus but allowed the copy to continue anyway.

To remove a virus, PC-cillin's Clean Wizard guides you smoothly through the cleaning process. But when we tried to clean the infected files on our system, we found that PC-cillin often couldn't remove the viruses. Like VirusScan, though, PC-cillin makes good use of Windows 95 and creates a visual and file report of the scan. But PC-cillin won't become a major player in the war on viruses until it better removes and detects macro viruses.

PC-cillin 95. Estimated street price: $49.95. Requires: 386-based PC or better, 4MB RAM, 2.5MB hard disk space, Microsoft Windows 3.*x* or later. TouchStone Software Corp., Huntington Beach, CA.
(No Indian partner.)

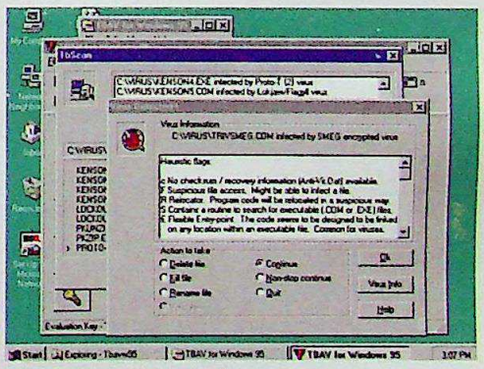
THUNDERBYTE CORP.

ThunderByte Anti-Virus Utilities for Windows 95

ThunderByte's flagship antivirus program, ThunderByte Anti-Virus Utilities for Windows 95 ($99) takes advantage of some of Windows 95's features and provides you with a good front-line defense against virus attack.

ThunderByte's real-time scanning doesn't quite match that found in the other products reviewed, but it can handle the newest class of virus threat: macro viruses. The program caught all the boot-sector viruses in our test suite, but it experienced occasional lockups and was unable to complete our test of files infected with in-the-wild viruses.

ThunderByte uses five detection methods to determine if a virus has infected a file. In addition to active monitoring (real-time file-activity checking) and signature matching, ThunderByte uses heuristics and CRC checksums. The fifth—and most advanced—method, called real-code emulation, simulates the execution of the file in memory and looks for any type of virus activity. This procedure detects encrypted viruses because such viruses must *decrypt* before they can



When ThunderByte detects a virus, it gives you information and prompts you for a response.

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run. ThunderByte sees this activity and flags the file as infected.

You have the choice of automatically starting ThunderByte when Windows 95 launches. The company recommends doing this because ThunderByte must be running for the real-time file I/O protection to be active. ThunderByte does not dock to the Taskbar as other Windows 95 products do; it's simply minimized. Unfortunately, the file monitor didn't seem to detect most of our infected file copies either from the floppy disk or on the local hard disk. A version that solves this problem should be available by the time you read this.

Like VirusScan and PC-cillin, ThunderByte can scan files directly from the Windows Explorer. ThunderByte also comes with a set of predefined scans, which simplifies the scanning process.

ThunderByte doesn't remove or disinfect files from the Windows environment. You must boot from a DOS system diskette and use ThunderByte's DOS version to clean the drive. Activity logging is good, and you can pick what information you want to see in the log. Alerting, also complete, includes pop-up windows. But ThunderByte doesn't provide broadcast or e-mail notification of virus alerts.

Though it's one of the best boot-sector virus detectors on the market, ThunderByte unfortunately falls short in real-time detection and integration with Windows 95. **ThunderByte Anti-Virus Utilities for Windows 95.** List price: $99. Requires: 386-based PC or better, 4MB RAM, 1MB hard disk space, Microsoft Windows 95. ThunderByte Corp., Messena, NY.

(No Indian partner.)

LOOK SOFTWARE SYSTEMS INC.

Virus Alert

One of the two 32-bit DOS-based virus scanners in the market today, Virus Alert 4.1 ($69.95) from Look Software uses a DOS TSR to perform its real-time scanning. Under Windows 95, though, Virus Alert doesn't quite make the grade.

On our detection tests, Virus Alert missed only one boot-sector virus and nine zoo viruses in our sample. But this product's TSR for real-time file monitoring is not Windows 95–compatible (Look Software expects to have this fixed by the time you read this), and the user interface lacks any integration with the operating system.

Virus Alert uses signature matching to detect known viruses and relies on a helper program, Onguard, to monitor the system in real time. This TSR tracks all file reads and writes from floppy disks and stops viruses before they can invade your system. Unfortunately, we experienced severe lock-up problems when the TSR was active on Windows 95. Without the TSR, you must rely on your disk scans to detect a virus infection.



Virus Alert was the best scanner out of the nine reviewed, but it lacks real-time scanning.

You can scan your system using your own command line parameters, a feature that would be handier if the software included more accessible documentation: You must scroll through the documentation files just to find the list of command line switches and then either memorize them or write them down to implement later. If the built-in scans don't suffice, you'll have to print out the help files.

Virus Alert proved impressive in sniffing out the viruses from our test collection. Its delete-and-restore methodology serves as its cleaning philosophy: You can delete the infected files and then restore them only from a backup—a process you may not always find convenient. Virus Alert can detect macro viruses in Word documents but will not remove them.

Virus Alert's manual also needs a little work. In the section about cleaning boot-sector viruses, we came across references to DOS's FDISK utility. The manual explains that you can repair most boot-sector viruses using FDISK's /MBR option, a tool that restores your master boot record. But this can be a devastating move if your system is infected with a virus that encrypts and moves a boot sector, as does Monkey. Look Software plans to add a warning to the manual in the software's next release.

On the whole, poor Windows 95 support along with the absence of real-time file monitoring limits Virus Alert, an otherwise appealing virus-detection program. **Virus Alert 4.1.** Estimated street price: $69.95. Requires: 386-based PC or better, 4MB RAM, 2MB hard disk space, Microsoft DOS 3.3 or later. Look Software Systems Inc., Ottawa, Ontario, Canada.

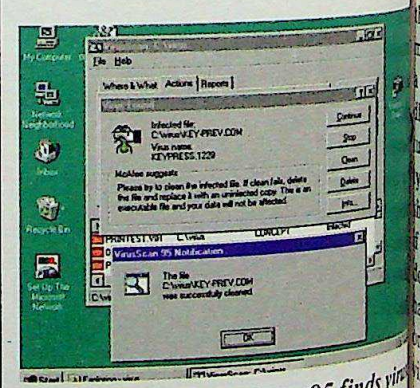
(No Indian partner.)

MCAFEE ASSOCIATES

VirusScan for Windows 95, BootShield

A veteran in the antivirus wars, McAfee VirusScan for Windows 95 ($65) proves the most Windows 95-ready of all the antivirus products in this evaluation.

VShield 95, McAfee's real-time virus protection, is available via the Windows Taskbar, and you can scan for viruses right from the Windows Explorer. On our detection tests, VirusScan for Windows missed only one in-the-wild file infector but, like IBM AntiVirus, skipped 11 boot-sector viruses. The boot-sector misses occur because of the way Windows 95 processes the boot sectors on floppy disks. McAfee is aware of this and plans to have a fix for it in the next version. The program can identify macro viruses currently and should be able to remove the more common ones in the next release.



VirusScan for Windows 95 finds viruses and then disinfects your system.

BootShield ($35), McAfee's companion software, works with all DOS and Windows-based antivirus programs

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NETWORK ANTIVIRUS SOLUTIONS

Your network file servers are the center for data storage, and they should be the center for virus detection. We've reviewed eight products that perform centralized virus protection on NetWare servers.

All of these products alert you when a binary intruder tries to sneak into your server. However, none except F-Prot and InocuLAN offers cleaning or disinfecting of viruses on the server; this is usually done at a client.

There are three reasons not to disinfect on the server. First is false positives. Even the best antivirus products can mistake a clean file for one with a virus and possibly delete your program or data. Second is performance. You don't want your network to slow down every time the NLM tries to disinfect a file. Third is safety. Just because a product says it cleaned a program, do you trust it with your most valuable data—the data on your server?

These products vary in what they let you do with infected files, the load they put on the file server, and the way that you control them. Some include client-side software that complements the server NLM. More important than a clever interface are good scanning options and great detection.

Watch prices carefully: Vendors offer a variety of pricing schemes. The vendor's reputation is important because you have to count on updates to the antivirus library. Speed, although an issue, is not a defining factor.

HERE ARE EIGHT PACKAGES THAT PATROL FOR VIRUSES ON YOUR NETWARE SERVER—AND HELP YOU COMBAT THEM.

By Steve Rigney

DOCTOR ANTIVIRUS FOR NETWARE

Thompson Network Software's product retails for $300 per server and supplies mainly the basics. Doctor has no client administration, so you have to rely on the console. Fortunately, Doctor offers both real-time and on-demand scanning and lets you schedule scans after hours.

Doctor lets you set up three different types of scan speeds: low, medium, and high. Unlike with InocuLAN, each setting performs the same scan but uses a different amount of CPU. The scan NLM detects only incoming files, so if a virus sneaks onto the network it could possibly infect users downloading files from that server. The NLM screen has an intuitive interface, but if you want to manage it remotely from a client PC you have to rely on NetWare's Rconsole or another remote utility.

When Doctor finds a virus it can either move the file to a safe directory or ignore it; you cannot rename or remove the file. We were impressed with Doctor's scanning speed on both clean and infected file transfers, but detection capabilities were not up to par. (Thompson Network Software Inc., Marietta, GA.)

(No Indian partner.)

F-PROT PROFESSIONAL FOR NETWARE

Retailing for $495, this is the only product we know of that disinfects viruses on the server. Command Software Systems' F-Prot has a good Windows interface; it also did well on our scan speed test and

includes McAfee's Scan for DOS. Its main component, BootLock, monitors the boot sector on your hard disk and effectively prevents a virus from modifying the boot sector, legitimately or not. BootLock will not keep a virus from attacking the file allocation table or the system setup (CMOS) areas of your computer directly, though.

While BootShield protects your boot sector from virus attack, VirusScan uses Code Tracing for rule-based signature scanning and Code Matrix to identify polymorphic viruses. VShield easily caught files copied to and from our test system across the network and from a floppy disk, and it also stopped infected files from leaving the system.

McAfee has enhanced VirusScan with new features such as integration into Explorer's right-mouse-button functionality. A context menu can pop up with a Scan for Viruses option. In addition, you can scan a single file by simply dragging it onto the VirusScan icon. With VirusScan, you also can create VirusScan Configuration (VSC) files to eliminate reselecting scan options for often-repeated tasks. VirusScan will create a shortcut to VSC , so you can launch it from your desktop.

VirusScan was able to remove most of the viruses in our test sample. A right mouse click on the infected file brings up a menu that lets you choose how to handle the infected file. One of the few features missing from VirusScan is the ability to create a rescue disk, though it does ship with its own. Activity logging is solid if not too fancy, and integration with Windows 95 ranks first rate. In all, McAfee has delivered another fine product, and once VirusScan improves its boot-sector virus detection, it will warrant a whole-hearted recommendation.

VirusScan for Windows 95. List price: $65. Requires: 386-based PC or better, 4MB RAM, 1MB hard disk space, Microsoft Windows 95. **BootShield.** List price: $35. Requires: 286-based PC or better, 640K RAM, 2MB hard disk space, Microsoft DOS 3.1 or later. McAfee Associates, Santa Clara, CA.

(No Indian partner.)

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missed detecting only one infection.

F-Prot offers real-time and on-demand scanning. You can schedule the scan or leave it to the NLM. If the NLM detects a virus it lets you move, delete, rename, disinfect, or log the offending file. No notification is built in, though, so you'll need to use a third-party solution.

Unlike NAV, F-Prot does not offer an attractive interface on the server. You can check scanner status, but you have no menu for changing settings. We found it hard to navigate through all features and settings without using the manual.

As with InocuLAN, you can use a single utility to create and deploy antivirus scans on multiple servers. You also can update the virus signatures on multiple servers from a single client PC. F-Prot is a little confusing, but its ability to take the cleaning off the client PC may save the network administrator a few steps. (Command Software Systems, Jupiter, FL.)
(No Indian partner.)

IBM ANTIVIRUS ENTERPRISE EDITION

IBM AntiVirus ($995 list for a 50-user license) includes an NLM for detection, client software for detection and cleaning, and an intuitive interface. It detected almost every virus on our tests, including file infectors and polymorphic strands.

The package includes both a real-time and an on-demand scanning engine. But the real-time option can scan files only one way: either all incoming or all outgoing. Other products can scan incoming and outgoing files simultaneously.

IBM AntiVirus lets you rename, move, delete, or purge an infected file from the server's FAT tables; it also locks the file so it cannot be opened. You can change all the options from a menu on the server console. To disinfect a file, you must use the AntiVirus desktop software.

IBM AntiVirus keeps a log of all virus activity on your file server, including the node address of user who copied them there. You can also configure AntiVirus to notify you via e-mail using a MHS gateway or a NetWare broadcast message. (IBM Corp., Sterling Forest, NY.)

(Indian partner, TISL, Bangalore.)

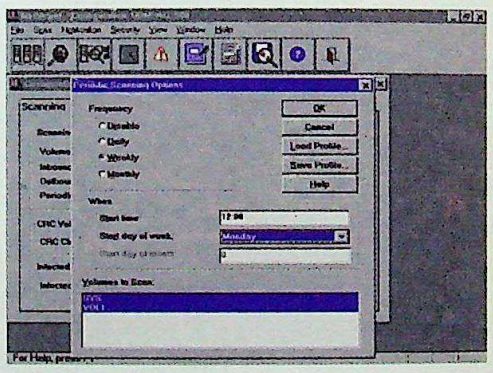
INOCULAN 4.0 FOR NETWARE

Cheyenne's InocuLAN, our second favorite, offers easy installation, a good interface, and options. The unlimited edition is $995 per server; the 25-user package, $395. InocuLAN is ideal for large enterprise networks because it lets you monitor and control several servers running the NLM from a single location. It works with NetWare 3.*x* and 4.*x* servers.

InocuLAN has three types of scans: fast, secure, and reviewer—for various degrees of scan. The package offers real-time and on-demand scanning.

InocuLAN can log off any client PCs that are not running antivirus software. It can also distribute the client software and new virus signatures to client PCs. It can even create an emergency disk that contains system, CMOS, and directory information for client PCs.

InocuLAN lets you remove, rename, purge, or delete an infected file. You can perform the clean function from the NLM server console screen, but it cannot clean during real-time scans, only during on-demand scans.



NetShield performs real-time and scheduled scans for inbound and outbound files.

Although the software is not as powerful as NAV's, it has some useful utilities. One is the ability to detect the address of user who sent the virus to the server and send a broadcast message alerting him or her to the problem. InocuLAN was a leader on our scanning speed test and detected nearly all of the viruses on our detection test. (Cheyenne Software Inc., Rosalyn Heights, NY.)
(Indian partner Onward Technologies, Maswah Bhawan, Saki Vihar Road, Bombay 400 072. Tel: 8214182/4981; Fax: 821420.)

INTEL LANDESK VIRUS PROTECT

Though part of the powerful LANDesk network-management suite, Virus Protect is strong enough to stand on its own. It retails for $995 per server and offers powerful NLM-based statistics and control. The NLM menu is great, and the Windows interface is even better. The Virus Protect NLM performs on-demand and real-time scanning and offers the best reports of any product in this roundup.

The Virus Protect scanner tracks multiple events—an infected file, checksum change, attempted modification, NLM load, and even an out-of-data signature file. If any of these are triggered, it sends the information to the administrator.

Even with all of this checking going on, Virus Protect was near the top on our scanning speed test. On our detection test, though, it was in the middle of the pack. Virus Protect limits anyone, even the supervisor, from copying infected files to or from the server.

Our favorite feature is Virus Protect's customizable log files. You can configure them to report multiple virus encounters including date and time, logger, filename, virus name, action, and more.

Virus Protect lacks somewhat in notification; it has only basic NetWare broadcasts. You can, however, use the LANDesk Alert Management System for alerts and notification. It is part of the LANdesk package and costs $[illegible] for five nodes. (Intel Corp., Hillsboro, OR.)
(Indian subsidiary Intel Asia, Bangalore. Indian partners Godrej Trading, Bombay; Priya International, Bambay.)

NETSHIELD 2.3 FOR NETWARE

Probably the biggest name in virus detection, McAfee is also known for its universal dial-up product distribution system, which has infiltrated the company's products into organizations around the world. It's easy to try a McAfee product: Just call up and download.

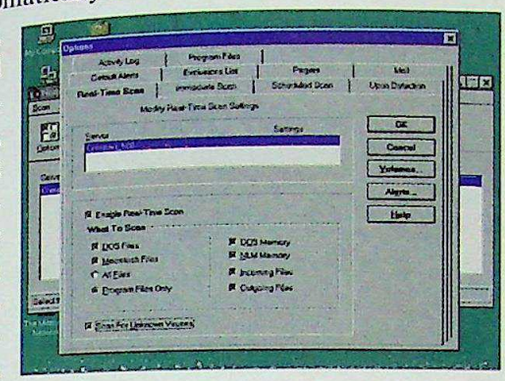
NetShield is fairly inexpensive, retailing at $450 for a 25-user license. Like other products, the NetShield NLM is designed only for detection; you have to use the VirusScan client software to clean infected files. Although all the products were pretty close in our scan speed tests, NetShield surprised us by being near the bottom, particularly on our infected-file transfer. However, NetShield did well on the detection phase of our tests.

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We were also impressed with installation. Netshield comes on a CD-ROM and includes all the updated NLMs you need for a NetWare 3.*x* or 4.*x* server. The installation creates an NCF (NetWare Configuration File) that automatically loads all of the NetShield NLMs.

The NetShield NLM performs real-time, on-demand, and scheduled scans for inbound and outbound files. It is fully configurable from both the server console and from a Windows utility and has excellent activity reporting options.



Among its strong features, Norton AntiVirus for NetWare includes great scanning options.

When NetShield detects a possible virus, it lets you ignore, delete, or rename the file. Netshield also offers excellent notification features that you can configure from the console. You can instruct it to send a page, use MHS-based e-mail, NetWare broadcast, or post a message on the console when it detects a possible virus. (McAfee Associates Inc., Santa Clara, CA.

(No Indian partner.)

NORTON ANTIVIRUS FOR NETWARE

Symantec's entry earned our Editors' Choice with a great interface, easy administration, and good options. Norton AntiVirus for NetWare Version 2.0 (NAV) also performed well on our scanning speed test and detection test. NAV recognizes Novell's NetWare Directory Services (NDS) and thus will work with both your NetWare 3.*x* and 4.*x* servers. It retails for $599 for ten-user licenses, which include protection for servers and clients.

Installation went well; the scan NLM works in real-time or on-demand and includes a scheduling feature. The NLM will scan both inbound and outbound files. All of these settings are performed using a Windows utility on the client PC. However, you can start and stop a virus scan from the server console.

When a virus is detected, you can delete, rename, copy, or move the file, or deny access to the file until the virus is cleaned. You can customize the types of files you scan based on extensions.

One helpful option in the NAV Windows utility is the ability to determine how much of a load you'll allow the NLM to put on the server's CPU. The more CPU power you allocate, the faster the scan. The trade-off is reduced server performance. You can also keep a log of activity and choose both the type of scan and the notification options. If NAV detects a virus, it can send a NetWare broadcast message, e-mail, or a page. (Symantec Corp., Cupertino, CA.

(Indian partners Infosys Technologies, Bangalore; Sonata, Bangalore;)

VIRUSAFE LAN

Eliashim's ViruSafe ($999 list for an unlimited server license) consists of two pieces: ViruSafe LAN and ViruSafe NLM. You run the LAN portion at login time to protect your server from clients with viruses. The NLM is an on-demand scanner.

ViruSafe, however, does not have an intuitive interface, good documentation, or some of the utilities we look for in a powerful NetWare antivirus solution. Because ViruSafe doesn't offer a real-time scan, we could not complete our scanning speed test. ViruSafe also performed poorly on our detection test, especially when we scanned for polymorphic viruses.

Installation consists of running a DOS-based utility to copy files to the server. To use the NLM scanner remotely, you must also run VS.COM on each client PC. You also have to manually edit the Autoexec file on your server unless you want to load the NLM each time you restart NetWare.

You can schedule on-demand scans, but this requires configuration and monitoring. You can also rely on the client software, but smart users could disable that feature. When ViruSafe detects a virus, it can delete, move, ignore, or clean the file using the client software. The only notification is a NetWare broadcast to specific users. (EliaShim Inc., Pembroke Pines, FL.

(No Indian partner.)

One More Feather in the Cap of **PC Magazine**

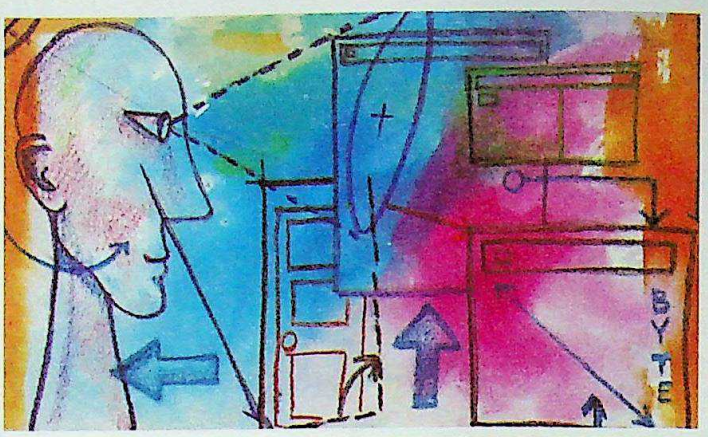
Maximum Ad Revenue Among US Magazines

PC Magazine has earned the rare distinction of attracting the maximum number of advertisement pages among US magazines.

According to Publishers' Information Bureau, an independent body of publishers in the US, **PC Magazine** ran 6,314 advertisement pages in its fortnightly issues in 1995. The number does not include the advertisement pages run by **PC Magazine** licencees in other parts of the world including India. **Forbes**, which secured the second rank, was a long way behind with 4,540 ad pages. **Time** was placed third with 2,384 ad pages.

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FILE VIEWERS

NOTHING SPEEDS UP YOUR WORK LIKE A UTILITY THAT GIVES YOU A QUICK WAY TO LOOK AT YOUR COLLECTION OF FILES, WHETHER YOU HAVE THE ASSOCIATED APPLICATIONS OR NOT.

By Edward Mendelson

Windows 95 lets you give long names to your files, but long names can't tell you everything about what's inside the files. Every operating system has developed a small industry of utilities that let you view the contents of a file without opening the application that created it. The third-party viewer utilities written for Windows 95 support an unprecedented range of file formats, but they all present—to some degree—an interface that's inconsistent, awkward, or both.

Basically, a viewer shows you what's inside a file as quickly as possible. All viewers include the ability to search within a file for text and to zoom in and out of graphics images. Viewers should support all major word processing, spreadsheet, and graphics formats—and all existing packages do. Most support additional formats such as databases, presentation graphics, and obsolete DOS- and Unix-based word processor and spreadsheet formats.

As this story went to press, four 32-bit viewer utilities were on the market: Canyon Software's Drag and View 95, FTP Software's KEYview 4.2, Inso's Quick View Plus, and Pacific Gold Coast's TurboBrowser 5.0. You can call up the first three from the context menus in Windows Explorer and from the file management programs in packages like Norton Navigator and PowerDesk.

The more ambitious products support conversions between one format and another, but the full-scale file conversion programs common under Windows 3.*x* haven't yet arrived for Windows 95. If you want to convert one word-processing format into another, one spreadsheet format into another, or one database format into another, you may have to rely on the conversion filters built into your applications—or wait for a new generation of file viewers.

By the time you read this, Adobe Systems will have bundled two powerful viewer and converter packages recent acquired from Mastersoft: Viewer 95 a Word for Word (along with a docum comparison utility) will form a $149 pa age called Adobe File Utilities. Note a that Windows 95 comes with Quick Vi a reduced version of Quick View Pl

CANYON SOFTWARE

Drag and View 95

ALL REVIEWS BY EDWARD MENDELSON

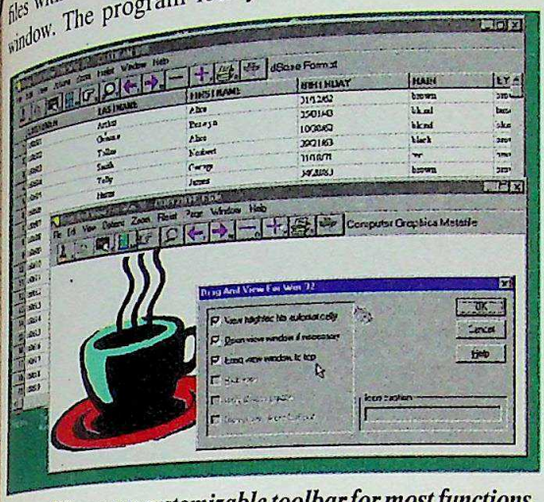
Canyon Software's Drag and View ($35 street) doesn't try to display ev known word processor or graphics form but because it's a multimedia player well as a file viewer, it helps you man file types that other viewers can't han at all. It also lets you edit plain text files its viewer. Drag and View plays Windo sound and video files, in addition to playing standard word processor, gra ics, spreadsheet, and database form

Under Windows 95, the program is signed to run only from the context m (accessed with a right mouse click) of or more selected files in an Explorer w dow; under Windows NT, it runs as a Manager add-on or as an icon that ser as a drop target for files you want to v

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Once the program starts, you can use its File/Open dialog box to view additional files without opening another Explorer window. The program lets you open as many files as your computer's memory permits, and you can switch the display to each file in turn using keyboard shortcuts or a drop-down list. Drag and View displays all files in the same user-selectable font and size. It shows word processing files without formatted tables, graphics, footnotes, or columns. Spreadsheet charts and dBASE files appear in the form of their underlying tabular data. Unlike most other viewer software, Drag and View can display Adobe's PDF format, but more slowly and less accurately than it displays other graphics formats. File types not recognized by the program are displayed in ASCII or HEX mode.



Drag and View uses a customizable toolbar for most functions. You can also use the accelerator keys to access functions.

THE DIFFERENCE

Though Drag and View's multimedia support is nice, the package still lacks some features found in other viewers. The program can list the contents of .ZIP and .LZH compressed files, but it won't expand the compressed files so you can view them. The keyboard interface is inconsistent: You can access some of the items on the top-line menu with standard Alt–letter key combinations, but you have to press F10 and then a letter key to access others if you don't use the mouse. The command to print a file doesn't appear on the top-line menu at all, although you can access it from a customizable toolbar and a keyboard shortcut.

Any graphics file, whether vector or raster, can be converted into one of the raster formats supported by the program. But you can't convert word processing, spreadsheet, or database files between one application's format and another. You can select all or part of a file in the viewer and paste the text into a word processor or spreadsheet, but this technique is probably more primitive than the import features of your applications.

Drag and View isn't the most polished or ambitious viewer, but it's compact and unobtrusive, and it performs most basic viewing tasks. If you want to check it out for free, you can download a shareware version that comes with a limited set of viewers from Canyon's Web site.

Drag and View 95. Estimated street price: $35. Requires: 386-based PC or better, 8MB RAM, 4MB hard disk space, Microsoft Windows 95 or Windows NT. Canyon Software, San Rafael, CA.

(No Indian partner.)

FTP SOFTWARE INC.

KEYview

FTP Software's $49.95 KEYview 4.2 displays standard word processor, graphics, and spreadsheet files, but you'll probably prefer it to other file viewers only if you need to view and convert files from Unix-based word processors such as Applix's Asterix or Quadratron's CliqWord and Q-One. As a Windows file viewer and converter (with 16- and 32-bit versions in the same package), KEYview performs basic tasks well, but it suffers from annoying interface flaws and disruptive bugs.

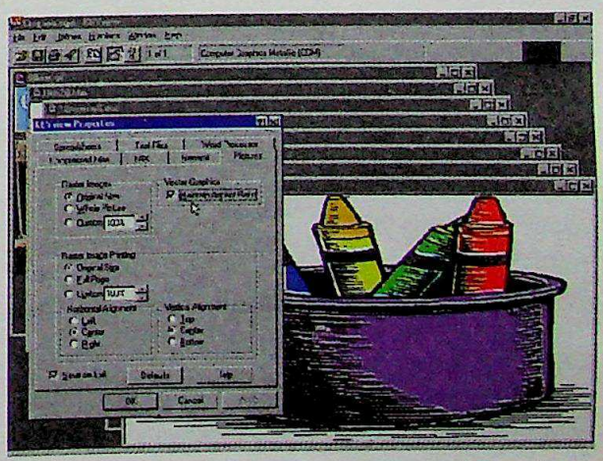
You can run KEYview as a standalone application that displays up to ten files at once. Alternatively, you can launch the viewer from a context menu in Windows Explorer. Either way, the viewer lets you convert files using the File/Save As menu, but the conversion module can also run standalone and in batch mode. The viewer displays standard word processor formats from Ami Pro to WordStar but not XyWrite. Graphics support covers standard bitmap, vector, and fax formats, including Encapsulated PostScript and Targa, but not CorelDraw or Photo CD. The only spreadsheets supported are Excel and Lotus 1-2-3, and the viewer offers no support for databases.

KEYview creates and opens compressed files in BinHex and Unix-standard formats like Tar, and it can open but not create .ZIP files. A copy of Adobe's Acrobat 2.1 viewer also comes in the package. If you open a file in a format for which you didn't install a viewer, the program offers to install the right viewer on the fly—although when we used this option with the DCX viewer, the program went into a loop and never installed the viewer.

KEY POINTS

KEYview displays pictures, tables, columns, and endnotes in word processing files, although footnotes can't appear at the foot of the page. You can search for text, delete or print files from the viewer, and extract an image from a fax file for copying or printing. An option to preserve the aspect ratio of CGM and .WPG vector images simply doesn't work, so these images always appear distorted. When you select a file to save from a compressed archive, the program doesn't remember the filename and makes you type it again.

When we chose a custom install, all shell extensions from other vendors disappeared from Windows context menus—and from the Windows registry—after KEYview was installed. This



KEYview's Maintain Aspect Ratio checkbox shown here simply doesn't work in the current release.

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Quick View Plus

The Quick View mini-app that ships with Windows 95 is a useful addition to the operating system, but it's not all that powerful. Almost any of the other applications evaluated here do a better job, but none better than Quick View's own big brother and our Editors' Choice, Quick View Plus from Inso Corp.

A pioneer in the viewer utility market, Inso has packed Quick View Plus with more file viewer descriptions than you can count. This includes some Macintosh word processing formats and nearly any type of graphics file format you can imagine. Quick View Plus elegantly integrates with Windows 95 and other utilities. It also has some powerful search features that other applications lack. If, for example, you use Quick View Plus to display a file after performing a Windows 95 advanced find-file search, it automatically highlights the search text.

Though Quick View Plus can convert most graphics file types to .BMP files for use as Windows wallpaper, it really has little else to offer in the way of file conversion. For more esoteric file type support, you might want to look to FTP Software's KEYview, which handles a host of Unix-based word processors, including Applix's Asterix as well as Quadratron's CliqWord and Q-One. Canyon Software's Drag and View 95 doesn't handle as many exotic file as its competitors, but, notably, it can open and play a number of multimedia file types.

problem didn't occur when we chose the default installation option. (After we pointed out this problem, FTP prepared a patch, which can be found on its Web site.) KEYview installs itself in Netscape and Mosaic as the default viewer, so any .ZIP file you download opens first in KEYview before you get a chance to save it to disk.

KEYview's packaging describes the product as "the best Internet utility to view, print, and convert files," and especially useful for intranets in corporations that use mixed file formats. If you have hundreds of files in DEC WPS Plus or Wang WITA format that you want to view through a Web browser add-in, or if you're looking for file converters for Unix formats, then KEYview is the viewer you need. Otherwise, until FTP fixes the bugs in the next version, you may want to look elsewhere.

KEYview 4.2. List price: $49.95. Requires: 386-based PC or better, 8MB RAM, 5MB hard disk space, Microsoft Windows 95 or NT. FTP Software Inc., Andover, MA. *(Indian partners Priya International, Bombay; T-net, New Delhi.)*

INSO CORP.

Quick View Plus

If you own the CD-ROM version of Windows 95, you already have a copy of Windows' built-in file viewer, Quick View, and you shouldn't hesitate to upgrade to the full 32-bit-only version in the form of Quick View Plus ($49 street). Both versions come from Inso Corp., which last year acquired Systems Compatibility Corp., the well-known manufacturer of file viewers.

The reduced version that comes with Windows 95 and the commercial version both integrate tightly with Windows and third-party utilities like Norton Navigator and PowerDesk. The bare-bones Quick View offers a limited set of standard formats using a single font; the fuller Quick View Plus displays files in virtually every PC-based format, past and present.

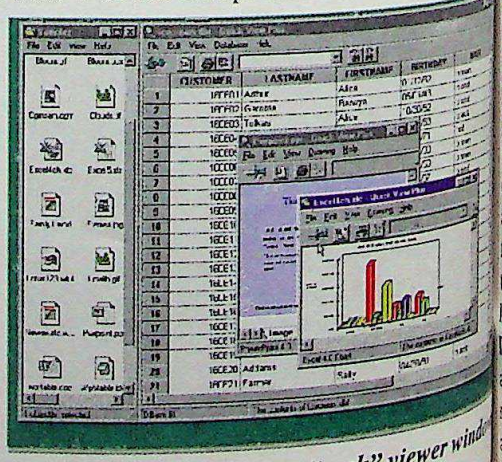
Quick View Plus doesn't convert files from one format to another, except for a command that converts any vector or graphics file into Windows wallpaper. You can save a file from the viewer window to the clipboard and then paste it into a application, but if you transport a word processor file in this way, you'll lose footnotes and much of the formatting.

Quick View Plus, like Quick View, appears as an option on the context menu files in Windows Explorer. After you open Quick View Plus from the context menu of one or a group of files, you can display other files by dragging their filenames to the viewer window. When you use Windows 95's built-in Find dialog to locate a file that contains specified text, and then use Quick View Plus to display the file, the file appears with the text highlighted.

DISPLAY AWAY

The program displays all significant PC-based word processor formats, and even older formats like XyWrite and DisplayWrite. HTML files appear complete with many up-to-date Netscape features. Quick View Plus also supports a wide range of Macintosh formats but far fewer Unix word processors than those covered by KEYview. All these files display fonts, graphics, and tables but not columns. Graphics support covers virtually every format used in the IBM-compatible universe. Spreadsheets and databases emerge in tabular formats, and spreadsheet charts display graphically. The program's spreadsheet support ranges from ancient Multiplan to the latest Quattro Pro version, and databases range from FirstChoice to R:BASE, Paradox, and Access.

At any time, you can switch the viewer into hex or various plain text modes, including Unicode. Standard PC and Unix-based compressed formats appear in a list of the compressed filenames; when you



Quick View Plus lets you "tack" viewer windows to Explorer or let them float free.

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File Viewers

PC MAGAZINE EDITORS' CHOICE

Products listed in alphabetical order	Drag and View 95	KEYview 4.2	Quick View Plus	TurboBrowser 5.0
Installs as a standalone viewer	○	○	○	○
Can search for text in files	○	○	○	○
Can convert graphics formats		○		
Can convert word processor formats	○	○	○	○
Can display unregistered file types	○		○	○
Contains a hexadecimal viewer		○		
Can display multiple text columns		○		○
File management features	○	○	○	○
Zoom feature	○	○	○	○
New viewers added as separate files	○	○	○	○

click on one of these names, the file displays in a second window, and you can save it to a disk in expanded form. If you view an executable file or DLL, Quick View Plus displays advanced technical information useful to programmers.

An installation option lets you install Quick View Plus as the default viewer in your Web browser. You may want to avoid this option, because Quick View Plus will open downloaded .ZIP files, and you can then save a .ZIP file only by extracting and saving its contents.

Keyboard users may feel shortchanged, because you need the mouse to return the cursor into the viewer window after using the Find command. You also can't use the keyboard to access the list of files in a compressed archive. But these minor flaws shouldn't keep you from adding Quick View Plus to your system, even if you supplement it with other utilities for converting files from one format to another.

Quick View Plus. Estimated street price: $49. Requires: 386-based PC or better, 4MB RAM, 5MB hard disk space, Microsoft Windows 95. Inso Corp., Chicago, IL.

(No Indian partner.)

PACIFIC GOLD COAST CORP.

TurboBrowser

Pacific Gold Coast Corp.'s TurboBrowser 5.0 ($50 street) fits on a single disk, and although it doesn't display nearly as many file types as other packages, it surpasses them in file management functions. Unlike Quick View Plus, KEYview, and Drag and View, it runs only as a standalone and can't be attached to the context menu in Windows Explorer. Instead, it acts as a substitute for Explorer, imitating many of Explorer's features in a more complex and confusing interface.

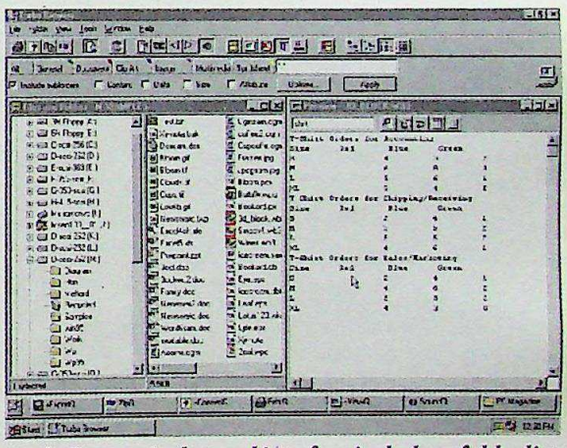
TurboBrowser normally displays two windows. One is an Explorer-style window with two panes—a tree-structured list of folders on one side and a list of files on the other. The other window shows the contents of the file selected in the file list. The top line menu includes file-selection options similar to those in Explorer, plus a keyboard-accessible option to reverse the sort order—an option available only with the mouse in Explorer itself. An optional toolbar includes menus that let you filter directory listings so that you see only the names of word-processor, graphics, spreadsheet, or other file categories—or only the names of files created by a specific application. Notably, TurboBrowser's search options—by exact-case text, approximate matches, and file attributes—offer more power than Explorer's.

TWO IN ONE

A second optional toolbar, called the Qbar, sits on the Windows desktop—outside TurboBrowser's own window—and serves as a drop target for filenames. You can drop filenames on buttons, which TurboBrowser stores for later operations. For example, if you drop filenames on the Export button, you build a list of files that you can then copy in bulk to a floppy disk. Similarly, you can convert graphics files stored on the Convert button to other graphics formats, and you can store miscellaneous file sets in a renamable Project button. TurboBrowser can extract ASCII text from word processor files and spreadsheets but can't convert one text format or spreadsheet format to another.

The viewer window displays all text, tables, and spreadsheets in a single font. Word processing files don't show graphics, and TurboBrowser displays columns in RTF files only. The program supports standard PC word processor, graphics, spreadsheet, and database formats—but you have to resize the preview window by hand to make .DBF files display in columns. And TurboBrowser sometimes misrecognizes formats: Some Excel charts and HTML files appeared as hexadecimal data. If a file won't display properly in the viewer, right-click on the filename and use the context menu to bring up Quick View or any other viewer installed in Windows Explorer.

TurboBrowser doesn't stand out as a file viewer, but if you want a file manager with lots of options in a small interface, you may prefer it to Windows Explorer. To test its unusual features you can download a time-limited but complete version from Pacific Gold Coast's forum on CompuServe (GO BROWSER) and on the company's FTP site (*ftp://members.aol.com/gobrowser*).



TurboBrowser's cluttered interface includes a folder list, file list, preview window, toolbar and the Qbar.

Though the unique Qbar feature saves time and effort when you need to print files from multiple directories at the same time, TurboBrowser's interface may feel overly cluttered for less complex file-management functions. □

TurboBrowser 5.0. Estimated street price: $50. Requires: 386-based PC or better, 2MB RAM, 3MB hard disk space, Microsoft Windows 95. Pacific Gold Coast Corp., Glen Cove, NY.

(No Indian partner.)

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MEMORY UTILITIES

UNDER WINDOWS 95, YOU MAY NOT NEED THEM OFTEN. BUT WHEN YOU DO, THERE'S NO ALTERNATIVE. WE TEST THE MARKET LEADERS TO SEE WHICH OFFERS THE MOST.

By Larry Seltzer

Do you need a conventional-memory manager under Microsoft Windows 95? The short answer is that most of the time most users don't. But there are a few special cases where a memory manager may be vital to run your application. To help you explore the options, we tested three Windows 95–compatible memory managers whose predecessors have been the mainstays of DOS and Windows memory management for years: Qualitas's MAX 8, Helix Software's Netroom 3.04, and Quarterdeck's QEMM 8. We show what Windows 95 can do on its own, what additional memory management can offer, and how these three products compare.

WHAT WINDOWS 95 CAN FIX

In exploring whether you need a memory manager, it's important to remember that Windows 95 solved many of the same problems memory managers solved under Windows 3.1*x*. The biggest change is that Windows 95 introduced support for 32-bit protected-mode drivers that consume no conventional memory. It ships with a huge collection of these drivers for many types of hardware, including mass-storage devices, network cards, CD-ROMs, PC Cards, modems, pointing devices and many other peripherals and adapters. Windows 95 also provides full-featured protected-mode network clients and protocols. The result is that even heavily configured systems may require no drivers whatsoever to be resident in memory below the 1MB mark.

Windows 95 and its native applications also place fewer demands on conventional memory (called Global DOS Memory under Windows) than Windows 3.1*x*; they avoid loading DLLs or drivers into conventional memory except when it's strictly necessary to do so (buffers for communicating with the system BIOS or real mode drivers are an example). All in all, most users of 16-bit and 32-bit Windows apps under Windows 95 simply don't h a problem with limited low memory.

Note that the Windows 95 upgrade stallation program does not generally move the real-mode drivers that load under Windows 3.1*x*, even when it lo 32-bit protected-mode replacements. T doesn't mean that you need mem management. Rather, it's an invitation remove the unneeded drivers. Try rem ing them one by one, by commenting the appropriate statements in your CO FIG.SYS and AUTOEXEC.BAT fi (make backups beforehand). You'll pr ably find that most or all served no fu tion and you'll find that you have far m memory in DOS sessions.

WHERE MEMORY MANAGERS CAN HELP

But there is one Windows 95 operati mode where third-party conventio memory managers are as necessary they've ever been: MS-DOS mode. Th Windows 95's DOS-compatibility m where the system boots into real-m DOS 7.0 (when you exit MS-DOS m the system restarts back into protec mode). MS-DOS mode is necessary compatibility with DOS applicati

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mainly games, which simply will not run under the protected-mode environment provided by Windows 95. The culprit can be sheer incompatibility, or the difficulty may occur because DOS boxes under Windows 95 don't provide enough conventional memory.

Since MS-DOS mode is basically real-mode DOS, it gives you none of the protected-mode device support which makes memory managers unnecessary under Windows 95. You need to install your CD-ROM drivers, MSCDEX.EXE, network drivers, sound card drivers, and whatever else you might need to run the application you want. You'll also need to load SmartDrive again, since MS-DOS mode doesn't provide Windows 95's built-in disk cache. After you've loaded these, you'll find that conventional memory is scarce, so you'll need to start loading things into high memory. That's where memory managers start earning their keep.

TESTING MEMORY MANAGERS

We began our tests by setting up Windows 95 on a Hewlett-Packard XU P/90 with 16MB of RAM, loading the Windows 95 protected-mode drivers for the system's integrated-Ethernet and SCSI adapters, and for a Creative Labs Sound Blaster AWE card. With the system idle, we launched a DOS session (DOS box) and checked the amount of free memory under 640K (conventional memory) and the amount of free memory between 640K and 1MB (upper memory). We did not measure the amount of free extended memory (XMS) at this point, as DOS boxes do not report a meaningful XMS figure. We then launched a default MS-DOS mode session and measured free conventional, upper, and XMS memory. Next we configured a new MS-DOS mode session that loaded real-mode drivers for the HP's built-in SCSI and Ethernet adapters, the sound card, NETX, MSCDEX, DOSKEY, and IFSMGR. We then measured the new totals for all three memory types.

We repeated this procedure after installing each memory-management package and running its standard optimization tools (for detailed results, see the charts).

The utility of a memory manager also depends on its tools. All the packages reviewed here provide some form of system-analysis tool although we found that none of them was quite up to date, at least under Windows 95. While the Windows 95 device enumerator or system registry can provide a wealth of information about

Memory Utilities for Windows 3.1

By Larry Seltzer

If you are still running Windows 3.1*x*, you're much more likely than a Windows 95 user to be in need of a powerful memory-management package. We recently tested five leading memory-enhancement products that claim to fix a variety of limitations in Windows 3.1*x* by increasing available memory, boosting system resources, managing Global DOS Memory, and applying a variety of other techniques. Here's a summary of what we found.

Hurricane 1.02 ($79.95), from Helix Software, the company which makes the Netroom product reviewed here, won our Editors' Choice award for essentially eliminating Global DOS and system resource limitations in Windows 3.1 while speeding up system performance. Hurricane also includes features that make the system more stable and provides an excellent set of system-analysis tools. We found that you must be willing to master some fairly advanced Windows concepts to get your system properly optimized. Helix expects to have a Windows 95 version of Hurricane out by the time this story appears.

The other four Windows 3.1*x* memory management products we tested all perform (or at least claim to perform) a technique called RAM compression. The idea is to compress some areas of memory so that you can fit more code and data into RAM. Quarterdeck's MagnaRAM 2 and QEMM 8 perform this trick under Windows 95 as well, but we remain skeptical of the theory behind it.

You can always make more room for programs by expanding the size of your swapfile, so the ultimate goal of RAM compression must be to improve performance by decreasing paging to the swap file. In our testing, we found that RAM compression increased system paging because it sets aside some portion of RAM to use as a buffer, thereby limiting the amount available for programs. This more than offset any gain from the compression.

SoftRAM95 2.0 (formerly $79.95; since recalled), from Syncronys Softcorp, was the most famous of the RAM compressors. But our testing clearly indicated that SoftRAM95 did not actually perform RAM compression. SoftRAM95 did not increase system resources as it claimed either, although its system-monitoring program presented numbers that seem to indicate that it did. As long ago as October 1995, Syncronys stated that SoftRAM95 failed to function under Windows 95 because of a bug. As we go to press, we are awaiting new SoftRAM releases for both Windows 3.1*x* and Windows 95.

We also tested RAM Doubler 1.02 ($99), from Connectix. RAM Doubler performs RAM compression but is more notable for doing a good job at expanding system resources. RAM Doubler might be the simplest program we've ever dealt with: You can give it to a complete novice and he or she could install it flawlessly.

Rounding out the field were Quarterdeck's MagnaRAM 2 and QEMM 8, both of which are also available for Windows 95. All of MagnaRAM 2's RAM compression features are bundled in QEMM 8. The RAM compression worked but resulted in slow system performance with almost no offsetting gain. QEMM 8 successfully boosted system resources and Global DOS memory, but not as much as Hurricane did.

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system configuration, none of these products took advantage of this fact.

With Windows 95 having taken away most of its reason for existence, the sun is clearly setting on the era of the memory manager. But for running stubborn DOS games or for supporting older hardware that does not have protected-mode drivers, it may still be your only option.

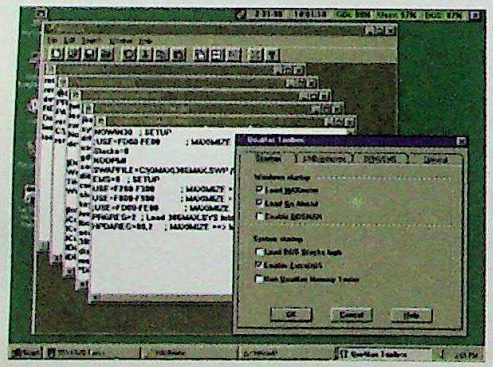
QUALITAS INC.

MAX 8

ALL REVIEWS BY LARRY SELTZER

Qualitas's MAX 8 is a Microsoft Windows 95–compatible upgrade to Qualitas's 386MAX product. It doesn't break significant new ground over the previous version, but setting it up and configuring it under Windows 95 was relatively smooth and painless.

On our tests, MAX 8's overall performance was respectable. It delivered as much conventional memory to MS-DOS mode sessions as Netroom, although it was not able to free up quite as much upper memory. We also noticed that MAX 8 consumed more extended memory than the other products we tested, a total of 496K.



MAX 8's easy utilities are behind the curve.

In addition to compatibility with Windows 95, MAX 8 has the ability to manage Global DOS Memory. This is arguably of little value under Windows 95, which manages Global DOS Memory pretty well on its own. Some Qualitas press releases have referred to Global DOS Memory in this context as a system resource. Semantics aside, MAX 8 does not actually manage *system resources*, which are a series of 64K memory heaps that Windows and Windows 95 use to store certain operating-system data structures.

Maximize, MAX 8's optimizing program, was as easy to use as the competition's, but we found one characteristic users should note: Instead of passing parameters to the memory manager loaded by CONFIG.SYS, MAX 8 stores its parameters in a Profile file named 386MAX.PRO, which it stores in the \QMAX directory. When creating multiple configurations, as we did in testing, each new maximization process overwrites the Profile parameters of the previous one. The solution is to create one Profile for each configuration you use and specify the file on the 386MAX .SYS command line in the appropriate CONFIG .SYS.

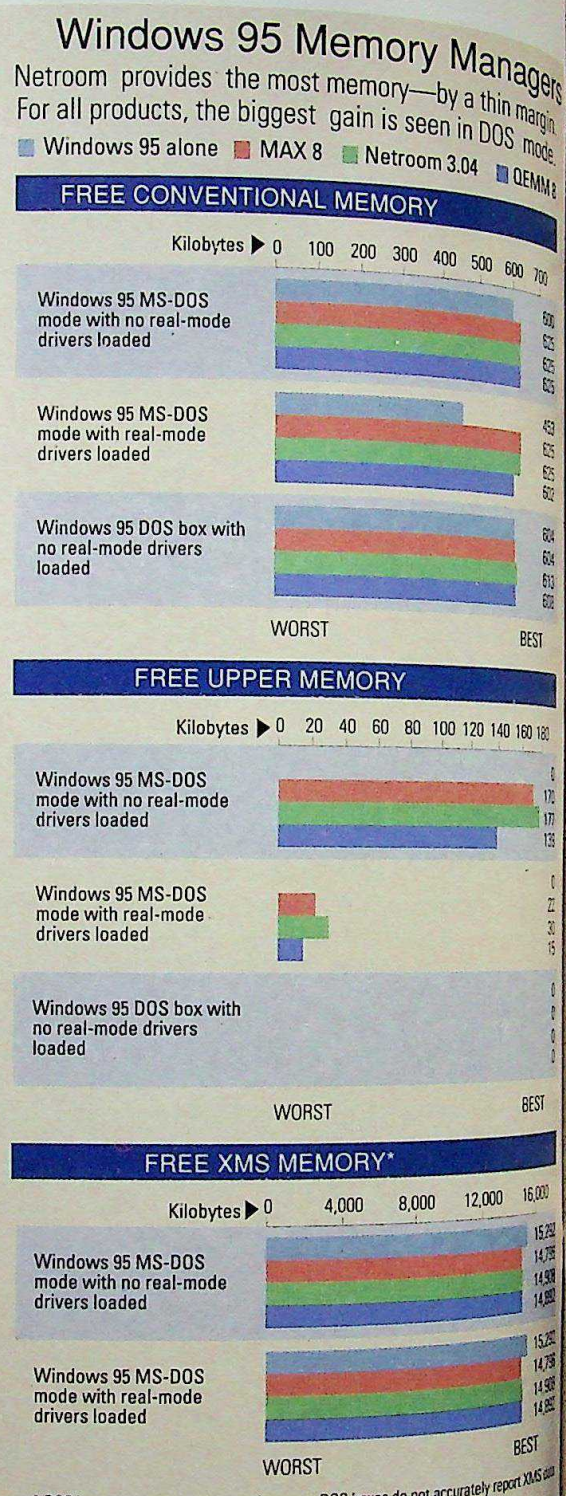
We ran into a minor configuration problem also encountered with Netroom. Part of MAX 8's maximization process, called ROMSearch, determines which areas of ROM in upper memory are expendable, and then it fills them in with RAM mapped from extended memory. The process was too aggressive on our system, and the system locked up when MAX 8 loaded after booting. We found that the problem was MAX 8's attempt to recover our F200-F300 memory range. Commenting out the appropriate line in the profile solved the problem.

MAX 8's utilities are well organized but provide less information than QEMM's or Netroom's. One tool, MAXedit, is a clone of Windows' Sysedit that can also edit the Profile. A potentially dangerous quirk of MAXedit is that it always edits 386MAX.PRO, even if you've specified a different file.

A small toolbar program called MAXmeter positions itself at the top right of the screen (overlaying any other toolbars you may have put there) and displays free User and GDI resources as well as free Global DOS Memory. MAX 8 also gives you a centralized configuration program called the Toolbox.

Users of BlueMAX, Qualitas's specialized MicroChannel product, should buy Version 8.01 of MAX 8, which should be available by the time this story appears. Version 8.0 does not support BlueMAX.

MAX 8 is a good product for conv



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tional memory management under Windows 95, even if it doesn't deliver quite as much free memory as the competition. As with QEMM and NetRoom though, it's of much less value than its predecessor was under 16-bit Windows 3.*x*.

MAX 8. List price: $99.95. Qualitas Inc., Bethesda, MD.

(No Indian partner.)

HELIX SOFTWARE CO.

Netroom

Netroom 3.04, from Helix Software, was never designed to run under Windows 95, but it works. In fact, it works so well that it delivered the best memory optimization of the three products we tested. On the other hand, Netroom lacks the polished setup and dedicated tools you'd want in a Windows 95 product, and not all of its features worked in testing. Helix expects to deliver a Windows 95 version later in the year that should address these issues.

The secret to Netroom's memory prowess is *cloaking,* a technology for rewriting BIOSs and real-mode device drivers to a proprietary protected-mode API. Cloaked software runs in protected mode, leaving almost no footprint below the 1MB line. Netroom comes with cloaked system and video BIOSs to replace the real-mode ones you're using. (The cloaked system BIOS was one of the features that didn't work on our test system). Some third parties have also written cloaked versions of their drivers (Stac Electronics' Stacker and various Logitech mouse drivers, for example). Netroom also comes with cloaked versions of other operating-system components such as the DOS stacks.



Netroom's DOS tools need an update.

Although Netroom yielded the best test numbers we saw, it took some effort for us to get it working right. Some of its more aggressive features were incompatible with our test system, and it took manual workarounds in order to get things working. Before we began installation, we were directed to make some small modifications to the MSDOS.SYS file (by the time you read this, Netroom 3.05 may be available, which should makes these modifications unnecessary). Despite these precautions, the system locked up during the optimization process, and it took a call to Helix tech support to find the correct command line parameters to solve the problem. Thereafter we had no trouble optimizing either the system as a whole or specific 7 sessions. Helix provides extensive notes for Windows 95 installation on its Web site and its CompuServe forum (GO CIS:HELIX). You should also check this information if you plan to upgrade to Windows 95 from a Windows 3.*x* system running Netroom.

Many users will get a feeling of déjà vu when they run Customiz, Netroom's memory optimization program. This is because Microsoft licensed a version of it to create MemMaker, the memory optimizer supplied with DOS 6.*x*. Customiz has additional features to work with Netroom, but it looks and feels quite similar.

Discover, Netroom's DOS-based system-analysis tool, provides a lot of information, but little of it is about Windows. Discover also makes extensive use of custom VGA fonts, which Windows does not support in a windowed session. Using the /CGA switch makes the display coherent but a bit plain. The DOS version of Discover pales in comparison to Helix's Discover for Windows, which ships with the company's Hurricane product.

If you need to free as much conventional and upper memory under Windows 95 as possible, Netroom is still the product to use—as it was with DOS and Windows 3.1*x*. We look forward to an update to bring its installation and tools up to date with the competition.

Netroom 3.04. Estimated street price: $69.95. Helix Software Co., Long Island City, NY.

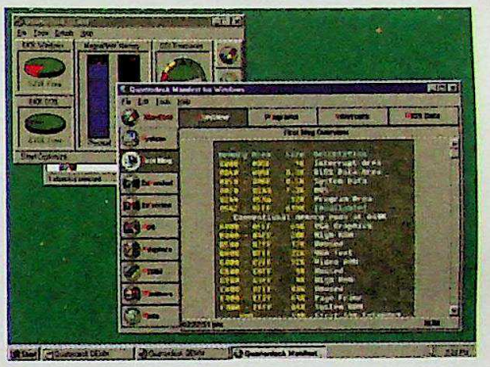
(No Indian partner.)

QUARTERDECK CORP.

QEMM 8

Of the three products we tested, QEMM 8, Version 8.01, was the least effective at freeing up conventional and upper memory. But its installation and optimization processes are so smooth that you may be willing to live with a couple of dozen kilobytes fewer in order to avoid the hassles you may experience with the other products.

Setup for our tests ran without incident. In general, we found that QEMM made intelligent choices about what to do and what to leave alone. For example, Optimize, QEMM 8's configuration optimization program, does not default to using QEMM's most aggressive features—such as attempting to move ROMs out of memory in order to use their space for RAM. This is a good idea, since the feature didn't work with our test system when we expressly tried to use it.



QEMM 8's Windows tools focus on DOS.

Our test system was also unable to work with QEMM 8's Stealth feature. Stealth is a method by which QEMM swaps parts of DOS, the BIOS, and TSRs in and out of the area below 1MB. Under Windows, QEMM uses an expanded-memory page frame to do this. Optimize tested our system for compatibility with Stealth and, as often happens, found a problem. It then chose—quite properly—not to enable Stealth, and from there, the installation proceeded smoothly.

By default, QEMM installs its QuickBoot feature, which replaces the system reboot code with a routine that skips lengthy parts of the process. This speeds up system reboots so much that it can be disconcerting. If you're waiting to hit F8 (boot options), you can miss the moment

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altogether. QuickBoot also speeds up the QEMM optimization process, which involves at least three reboots.

In fact, the only lengthy part of the optimization process occurs when QEMM is determining which of the millions of possible configurations is optimal. On our test system, Optimize started at about 80 million and counted down from there. The process takes a couple of minutes and we suspect that much of the actual time is spent simply displaying the countdown.

Quarterdeck integrates MagnaRAM, its RAM-compression product, with QEMM 8, and turns it on by default. In past testing under Windows 3.1, we found that MagnaRAM slows system performance without providing any significant benefit (for more details, see "Windows 3.1 Memory Enhancement Utilities," February 20, 1996). Ad hoc testing indicates that you would see similar results under Windows 95. The performance loss is likely to be insignificant, but it's unclear what benefit you get in exchange for it.

QEMM 8's system monitoring tools are all accessible from a single Windows-based program. Many provide a great deal of arcane information to sift through, but they are generally well laid out and accessible.

Manifest, Quarterdeck's system-analysis tool, is interesting but somewhat outdated. It mostly focuses on DOS-centric information, such as the memory layout below 1MB and in EMS, and every bit of detail it can get about your processor. When it comes to Windows information, however, Manifest falls short. You get very limited data on resource heaps and none of the information that Windows 95 provides about the devices in the system. Quarterdeck says that future versions may include such Windows 95–centric information.

If you need memory management under Windows 95, QEMM 8 won't give you quite as much memory as other products. But you'll have an easier time getting it than with any competitor we saw. □

QEMM 8, Version 8.01. List price: $99.95. Quarterdeck Corp., Marina Del Rey, CA. *(Indian partner Unison Computer Systems, Bombay.)*

5

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The Ultimate Utility Guide



DIAGNOSTIC UTILITIES

LOOKING FOR THE ROOT OF A PROBLEM? NOT SURE YOUR PC IS RUNNING OPTIMALLY? THESE FIVE PACKAGES LET YOU TEST IT, TUNE IT, AND FIX IT.

By Barry Simon

PCs are wonderful when they are up and running smoothly. But your trusty companion quickly becomes a rabid hellhound when glitches arise. To its credit, Microsoft has addressed some of the leading causes of PC-induced headaches with the Device Manager and Add New Hardware wizard in Windows 95. These help users identify the IRQ and DMA resources claimed by their peripherals and make adding both Plug and Play and non-PnP devices less of a black art.

Going that extra mile, though, left at least a few furlongs to be covered by other products: Windows 95 diagnostic utilities that not only report on what system resources you have but also diagnose and help remedy anomalies. Such packages can uninstall programs, check for bad RAM modules, identify and prune duplicate files or unlinked ("orphan") DLLs, and check system performance and offer suggestions as to how you might improve it.

The wide-ranging utilities packages covered elsewhere in this issue offer some reporting and troubleshooting as part of their collections (see the reviews of Norton Utilities and the memory managers Netroom and MAX 8). But none go as deep as the dedicated diagnostic packages we review in this section. Four Windows 95 products in this roundup—American Megatrends' PC Care 95, DiagSoft's QAPlus/Win-Win, TouchStone's WinCheckIt, and Quarterdeck's WINProbe 4—share a similar scope and focus. All are aimed toward sophisticated users or people who are responsible for troubleshooting the PC problems of others. A fifth—CyberMedia's First Aid 95—focuses on software troubleshooting and is aimed at a broader audience of PC users. The Windows 95 version of Discover Pro, from Helix Software Co., was not ready in time for this review but should be available when you read this.

To test the breadth and depth of the features offered by the five utilities, we installed each one on four test PCs that varied in complexity. We then ran the reporting and diagnostic portions to see if the software could correctly identify the configurations. We also tested the cleanup and tune-up functions to gauge what type of advice the products offered on deleting files and changing settings (such as cache sizes). We found that their accuracy and saliency varied widely, so read carefully to see which package best suits your needs.

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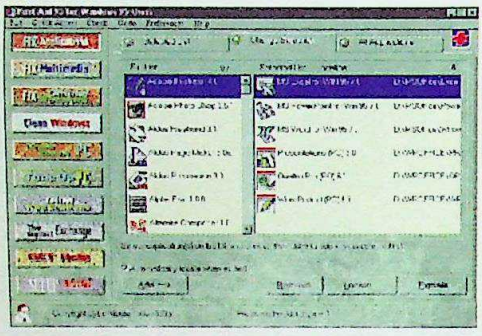
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CYBERMEDIA INC.

First Aid 95

ALL REVIEWS BY BARRY SIMON

CyberMedia's First Aid 95 ($79 list, $50 estimated street price) breaks the mold of the traditional diagnostic utility. It doesn't do hardware subsystem reporting or complex hardware diagnostics, leaving those functions to Windows 95, but starts from the premise that many of the problems users encounter in Windows are software-based. Some of the ideas behind First Aid 95 are brilliant and could be exceedingly useful, but this first Windows 95 version has some glitches that need to be ironed out.



First Aid 95's intuitive interface gives quick access to its software-oriented functions.

Perhaps the most welcome feature is crash protection. If a program generates a dreaded GPF (general protection fault), First Aid catches it and offers to let you save your work. On our tests, this feature worked reliably, though only with 16-bit applications; CyberMedia reports that support for 32-bit apps is a high priority and should be in the next release.

SUITABILITY TO TASK

First Aid 95

Reporting	N/A
Diagnostics	N/A
Tune-up	Good
Cleanup	Good

N/A—Not applicable: The product does not perform this task.

Another issue that First Aid tackles with aplomb is the misplaced DLL. The program uses its extensive database to check whether your application folders are missing required DLLs; it can then search your hard disk for any wayward ones and move them to the proper application. If a program you are running under Windows 3.1 or 95 can't find a DLL, First Aid pops up and offers to locate the DLL.

First Aid's uninstall module is limited to an explicit list of applications, though with more than 120 represented, the most popular ones are here. One nice touch: You can have it selectively uninstall particular application modules, such as a grammar checker.

First Aid will check desktop shortcuts to see if the programs associated with them are present and will also check the registry to see if any programs associated with the registered extensions are missing. But its logic is flawed. When we had no disk in drive A:, it informed us that a shortcut to A:\ was invalid and offered to remove the shortcut. And it got confused by paths with spaces in them, like those pointing toward files in Program Files.

The program ships with a knowledge base called Don't Panic, which is outdated: Its only printer advice is for Windows 2.1, and its information on Word for Windows is limited to Versions 1.0 and 2.0. By the time you read this, a database with an up-to-date list of technical-support phone numbers for over 2,500 vendors will have replaced Don't Panic.

Though some of the elements still need polishing, First Aid 95 offers enough useful features to make it worth the price of admission.

First Aid 95. List price: $79. CyberMedia Inc., Santa Monica, CA. *(No Indian partner.)*

Room for improvement

Though several of the diagnostic utilities we review here provide accurate, useful information, it is clear that these first Windows 95 versions need further polishing. We found several bugs that crashed our systems, as well as leftover advice suited to a Windows 3.1 system rather than the Windows 95 platforms we were testing.

What's more, not one of the five products excelled in all four categories: reporting, diagnostics, tune-up, and cleanup. Nevertheless, three products deserve an honorable mention.

American Megatrends' PC Care 95 ($40 street) has excellent diagnostics and an ambitious (though not infallible) reporting module. The 1.0 version we looked at had a number of problems, chief of which were weak tune-up and cleanup functions. Similarly, CyberMedia's First Aid 95 ($50 street) offers a novel take on the category. Its ability to catch GPFs and let you save your work is unique (and welcome), but right now this feature supports only 16-bit applications. We also found some minor glitches in the cleanup module that need to be ironed out.

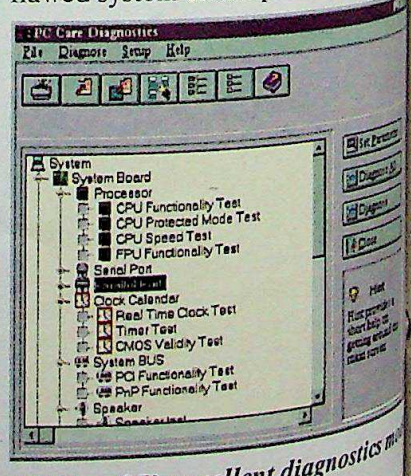
PC MAGAZINE EDITORS' CHOICE

Finally, TouchStone's WinCheckIt ($50 street) remains the king of system reporting utilities for the accuracy of its results. But now that Windows 95 has system reporting built-in, this function becomes less important. WinCheckIt's other functions don't yet stand out the way its system reporting does.

AMERICAN MEGATRENDS INC.

PC Care 95

American Megatrends Inc. (AMI), mak of the AMI BIOS, has long used its expe tise to produce one of the leading diagno tics programs. The company's first crack a Windows 95 version, PC Care 95 ($ street), has superb diagnostics, strong h flawed system cleanup modules, a som



PC Care 95's excellent diagnostics m ule even includes PCI tests.

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SUITABILITY TO TASK PC Care 95	
Reporting	Poor
Diagnostics	Excellent
Tune-up	Poor
Cleanup	Fair

what weak reporting module, and an unacceptable tune-up module.

If you want primarily a diagnostic utility, PC Care is the one to have. No Windows program has diagnostics as extensive or flexible. The package delivers four tests that help you root out hard disk problems (such as timing mismatches that could slow performance) and three tests for floppy disk drives, as well as tests for the PCI bus. There are tests for the PC speaker, graphics card, and CD ROM drive but none for sound cards.

PC Care is unique among the products in this roundup in having a time-saving batch mode for diagnostics. You can set up a test, save it as script, then load and run that script on all the PCs you need to check.

The reporting module in PC Care is extremely ambitious, conveying information that other programs do not handle about PCI-bus and BIOS options. But it had problems on our tests, crashing on two of the four test systems. AMI traced the problem to a PnP string in early Plug and Play BIOSs and has remedied the problem in an interim release.

On our typical systems, PC Care's reporting module worked fine. But on our most complex test system—where you would really need help beyond what Windows 95 delivers—PC Care missed one of the sound card IRQs, the network card IRQ, and two DMA channels. The multiple partitions on our 4GB disk confused it, and it got the amount of memory on the graphics card wrong. AMI is investigating.

The tune-up module in the version we reviewed still needs work. For example, it contained advice suited for Windows 3.1 but not Windows 95 (recommending that we install SmartDrv, which is built into Windows 95). Its ability to check and tune cache states and FIFO (first in, first out) states is a plus, and AMI promises work in this area to improve tune-up capabilities by the next release.

PC Care comes with two cleanup modules. One is an uninstall utility; the other searches for duplicate files, orphaned DLLs, and the like. But the module that finds orphaned DLLs is flawed and could remove essential files. For example, it said that the file PTTVIEW .DLL was orphaned because the associated .EXE (the Power Point Viewer) was not registered in the Start Menu. It even said one of the DLLs needed to run PC Care's own uninstall program was orphaned because that DLL is called by a second DLL rather than an executable. Again, AMI reports that these have issues have been addressed.

PC Care 95 has a solid scope, but AMI needs to smooth this version's rough edges.

PC Care 95. Estimated street price: $40. American Megatrends Inc., Norcross, GA. *(Indian partner Megasoft Systems, 223 Bomikhal, P.O. Rasulagarh, Bhubaneshwar 751 010. Tel: 481737.)*

DIAGSOFT INC.

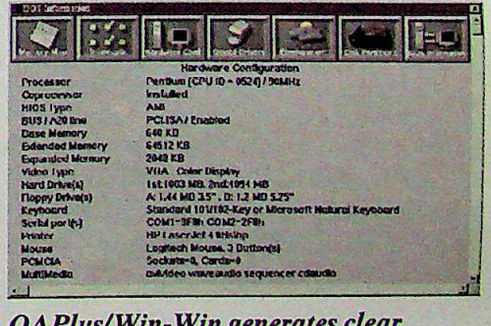
QAPlus/Win-Win

Unlike the other products in this roundup, DiagSoft's QAPlus/Win-Win ($65 street) has stayed focused on the traditional strengths of the category: reporting and diagnostics. While you get both the Windows 95 and Windows 3.1 versions in the box (hence the double *Win* in the name), you don't get tune-up or cleanup modules. Its diagnostic module is adequate, but the reporting utility could stand improvement.

SUITABILITY TO TASK QAPlus/Win-Win	
Reporting	Fair
Diagnostics	Good
Tune-up	N/A
Cleanup	N/A

N/A—Not applicable: The product does not perform this task.

On our complex machine, QAPlus's report missed both of the IRQs taken by the sound card. On another 486 test machine, it claimed that a free IRQ was occupied and knew that one IRQ was in use but didn't identify it as a SCSI card. It reports nothing about DMA channels, I/O ports, or the PCI bus, Plug and Play, SCSI IDs, graphics board memory, and serial UARTs. In its favor, QA's reporting of Windows' technical parameters (such as the metrics used by the display driver) is



QAPlus/Win-Win generates clear reports of your system's resources.

DIAGNOSTIC UTILITIES

How to Read the Suitability to Task Boxes

SUITABILITY TO TASK Product name	
Reporting	Excellent
Diagnostics	Good
Tune-up	Fair
Cleanup	Poor

Whether you are an IS manager responsible for other people's PCs or a power user who wants to keep tabs on what's going on inside that box, diagnostic utilities are handy tools to have around. They can pinpoint conflicts, check that your PC's subsystems are running correctly, and help you tune parameters to ensure optimal performance.

To excel in **reporting,** a product must provide a comprehensive and accurate accounting of the resources being used in your PC. Better products pay attention to items such as graphics board memory and SCSI IDs—items beyond those covered by the Windows 95 Device Manager.

For **diagnostics** we expected a product to be able to pinpoint a variety of problems in the memory, hard disk, and video subsystems. Better products also probe the PCI bus, CD-ROM drive I/O, and sound card performance. The ability to script and save a test to perform on several PCs was a plus.

To score well in **tune-up,** a product must deliver accurate advice relevant to settings in the Windows 95 Registry that would optimize performance. Better products clearly explain why changes would enhance performance and offer to make the changes for you if you choose.

As applications have become more complex, the **cleanup** functions that these packages offer have become more important. Better products can uninstall unwanted applications, root out duplicate files and leftover .TMP files, and locate missing or orphaned DLLs. Clear explanations of why the program thinks you should remove particular files are a must.

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extensive. Only Quarterdeck's WINProbe 4 (also reviewed here) is as thorough on this data.

QAPlus has a complete set of diagnostics including basic motherboard, graphics board, RAM, port, and disk tests. It also includes printer and mouse tests. But unlike with AMI's PC Care 95, the tests cannot be written into scripts for quick execution on multiple PCs. Alone among the five programs in this roundup, QAPlus sometimes crashed on our test systems during diagnostic tests.

QAPlus's interface was often ungainly. Many of its icons bring up panels that are modal; this prevents you from accessing help, which is on the menu in the main panel. One nice touch is DiagSoft's Electronic Technical Support Center (ETSC), which runs a quick set of diagnostics and phones DiagSoft's tech-support e-mail system. Simply leave a message (with the attached report) and technicians will be able to respond on the basis of detailed information.

Still, QAPlus is not the best of its breed. It faces stiff competition from PC Care on diagnosis and from WinCheckIt on reporting.

QAPlus/Win-Win. Estimated street price: $65. DiagSoft Inc., Scotts Valley, CA. *(Indian partner Infomart, 328/12, 2nd Block, Jayanagar, Bangalore 560 011. Tel: 6637770; Fax: 6637780.)*

TOUCHSTONE SOFTWARE CORP.

WinCheckIt

TouchStone Software Corp.'s CheckIt utility has long been the most accurate reporting software around, and the Windows 95-compatible WinCheckIt 4.0 ($50 street) continues that streak. With accurate IRQ and DMA reporting available from Windows itself, many users won't need WinCheckIt's more thorough module. But if it is your job to probe the PCs of others, WinCheckIt should be in your toolbox. The product also delivers diagnostic and cleanup features, though these are not as robust as its reporting functions.

SUITABILITY TO TASK

WinCheckIt	
Reporting	Good
Diagnostics	Good
Tune-up	N/A
Cleanup	Good

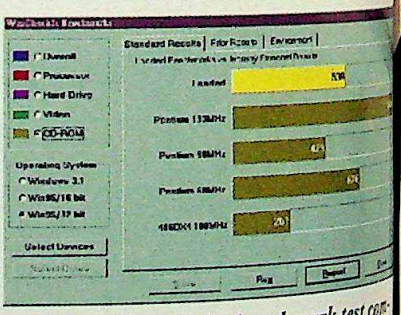
N/A—Not applicable: The product does not perform this task.

On all four of our test machines, WinCheckIt correctly identified all the IRQs in use and not in use. It did miss one DMA channel missed by all the programs (and presumably masked by Windows), but it was the only program that correctly found the DMA channels used by our Ensonique sound card. In fact, the only reporting error it made across the four machines was an incorrectly identified UART on a serial port that had a mouse attached to it. Unfortunately, WinCheckIt lacks the more advanced reporting features for such items as the PCI bus or SCSI ID information.

The product's diagnosis capabilities aren't as extensive as those of class leader, PC Care 95 (though basics such as RAM, motherboard, and I/O tests are offered), nor is there any kind of scripting available. TouchStone's CheckIt Diagnostic Kit, Version 4, a specialized product with advanced diagnostics (including scripting), is planned for release soon.

WinCheckIt doesn't offer tune-up advice, but it does include two cleanup programs. One, an uninstall program, has the convenient ability to find orphaned shortcuts: desktop or Start Menu items that point towards nonexistent executables. The second cleanup module, called Clean and Zip, does a good job of identifying all kinds of garbage that can build up on your hard disk—empty directories, .TMP files, duplicate files, and so on. A couple of oversights: The utility doesn't tell you why it has prompted you to prune a particular file on the cleanup list, and it makes decisions about duplicates solely on the basis of filenames without regard to file size.

As a bonus, TouchStone includes a CD with complete reference books on Windows and DOS. WinCheckIt



WinCheckIt includes benchmark test comparisons to gauge your PC's performance.

serves kudos for the accuracy of its reporting. Its other modules, while useful, could benefit from the thoroughness that went into its reporting module.

WinCheckIt. Estimated street price: $ TouchStone Software Corp., Hunting Beach, CA.
(No Indian partner.)

QUARTERDECK SOFTWARE CORP.

WINProbe 4

Quarterdeck Software's WINProbe ($50 street) is a jack-of-all-trades. Unfortunately, as in the old adage, it is master of none. It delivers system reporting

Diagnostic Utilities

○ YES ○ NO

Products listed in alphabetical order	First Aid 95	PC Care 95	QAPlus/ Win-Win	WinCheckIt	WINProbe 4
Street price	$50	$40	$65	$50	$50
Certified Windows 95–compatible	○	○	○	○	○
Registers in Windows 95 Uninstall List	○	○	○	○	○
Self-uninstall option	○	○	○	○	○
Reporting					
Reports on IRQs and DMAs	○	○	○	○	○
Reports on graphics board RAM	○	○	○	○	○
Reports on serial UART	○	○	○	○	○
Diagnostics					
Executes performance comparisons	○	○	○	○	○
Tests for bad RAM	○	○	○	○	○
Performs disk-surface test	○	○	○	○	○
Tune-Up, Cleanup, Troubleshooting					
Checks and tunes system files	○	○	○	○	○
Checks and tunes Registry settings	○	○	○	○	○
Uninstalls other programs	○	○	○	○	○
Finds duplicate files	○	○	○	○	○
Identifies orphan DLLs	○	○	○	○	○
Locates missing DLLs	○	○	○	○	○

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agnostics, some tuning advice, and cleanup help in the form of a duplicate file finder but doesn't excel at any of these tasks.

The reporting module is fairly thorough, covering even serial UARTs left out by others. But on our test systems, WINProbe's reports contained quite a few errors. On our most complex machine, it missed three IRQs: the second of the two IRQs taken by the sound card, the PS/2-style mouse IRQ, and the one taken by the network card. On another machine, it again missed three IRQs, including one taken by a SCSI controller. It also missed the DMA channels takenby the sound cards. In its favor, itsCOM port diagnosis was able to identify the UARTs even on the port that had the mouse attached to it, which most other programs missed.

SUITABILITY TO TASK

WINProbe 4

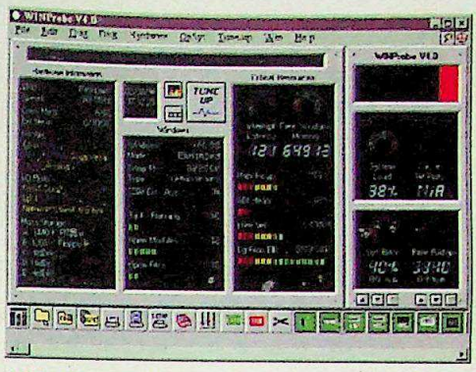
Reporting	Fair
Diagnostics	Good
Tune-up	Fair
Cleanup	N/A

N/A—Not applicable: The product does not perform this task.

The diagnostic modules include the basics: tests for bad RAM, disk surface tests, I/O checks, video tests, and so on. One standout was the sound card test, which lets you check whether stereo sound is working properly.

WINProbe comes with a lackluster tune-up module that's essentially a set of panels with Polonius-like advice (remove unused fonts, remove mouse drivers from CONFIG.SYS since Windows 95 includes a built-in mouse driver, and so on), with no links to allow automated implementation of that advice. Most of the advice is sound, although there are a few minor errors and one absolute whopper: It advises you to delete WINHELP.EXE and the Windows help files, but WINHELP.EXE is used to provide the help engine for *all* Windows applications, not just for Windows.

A few of WINProbe's user interface features are novel and notable. A push-pin icon toggles the reporting panel to a thin strip that monitors resource usage, cache usage, and CPU usage in real time. Another icon lets you save a report to a separate window so that you can see several reports at once. Bundled with the product is a bonus CD that includes Quarterdeck's Web Browser and Version 1.0 of Clean Sweep.



WINProbe 4's main screen packs a lot of information.

WINProbe has several nice touches, but compared with others, its functions are middle-of-the-pack. □

WINProbe 4. Estimated street price: $50. Quarterdeck Software Corp., Marina Del Rey, CA.
(Indian partner Unison Computer Systems, Bombay.)

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Performance

...And A Great Price !.



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NETWORK BACKUP UTILITIES

YOUR NETWARE SERVER IS BETTER PROTECTED THAN EVER. TODAY'S NETWORK BACKUP PACKAGES ARE RELIABLE AND FAST.

By Steve Rigney

You know that sinking feeling. It's 9:00 a.m., and you can't log on to the server. Finally, when you can, you manage to pull down the draft of that important report, the one you penned with the utmost care the evening before. Your boss is expecting it today. But instead of seeing your lovely file for a quick read-through before you submit it, all you see is a jumble of unrelated characters. Your LAN administrator comes to your rescue with a network backup package, but the struggle doesn't necessarily end there. Restoring your corrupted files can take longer than creating them did in the first place. All you can do is sit and wait—and wonder why things like this still happen.

Before the memory of such special moments drives you to nail-biting, take heart. The all-too-familiar process of trying to restore a file is turning from a nightmare into, well, at least only a semi-bad dream. The newest versions of network backup tools offers unprecedented reliability and ease of use. Some allow interoperability across a variety of NOSs, backup media, and even other backup packages.

In this roundup, we review network backup packages for servers running NetWare. Although many network administrators run a combination of NOSs these days and many are setting up Microsoft Windows NT Servers, NetWare continues to drive the lion's share of installed networks. And there are more third-party utilities available for it than for its competitors. Here we'll look at Cheyenne's ARCserve, Arcada's Backup Exec, St... Replica, and Seagate Storage Mana...

Each of these products carri... unique set of features, but the one th... you can count on is that they all co... through when it matters: Each comple... the most important tasks—network ba... up and restore—without problems.

SETTING SAIL

How should you go about choosing ... correct NetWare backup product for y... site? There are several factors to consi...

First, ask yourself how easy the pr... age must be to install and manage. E... of the products reviewed here relies o... Windows-based administration utility ... a series of NLMs (NetWare Load... Modules). Useful Windows admini... tion tools are essential, since any time y... load new NLMs onto your servers you ... risking conflicts. The Windows uti... are usually more intuitive than NetW... System Console and also let you ma...

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multiple servers from a single location.

NLMs—the second element in backup programs—communicate between the administration program and your backup media. They come with their own set of issues. NLMs depend on other specific NLMs. If you don't have the versions you need installed, everything can break down.

In turn, most backup utilities require specific versions of common NLMs, such as CLIB and Btrieve, and will not load if you have the wrong version running on your server. Look for a backup program that addresses this issue. We were impressed that ARCserve, our Editors' Choice, not only ships with all of the proper versions of the NLMs but also includes an intelligent loader that walks you through loading the modules and warns you if a version is wrong anywhere.

Another challenge you may encounter while installing NLM-based utilities is loading them in the right order: If you get the order wrong, your package won't work. ARCserve, Backup Exec, and Storage Manager include NetWare Configuration Files (NCFs) that help you keep all of the necessary files in their correct order when you want to run a backup. Replica's solution is somewhat more primitive: It makes changes to your existing AUTOEXECUTE.NCF but does not supply a new file specifically for backup purposes.

Once you have everything installed, how hard is it to start using the product? A friendly interface is crucial—unless you enjoy spending several weeks learning features. The backup products we reviewed range in complexity, but each offers a fairly intuitive interface.

Backup Exec and Replica were the easiest to use, though ARCserve and Storage Manager offer better options: strong report generation, tape management, and notification. They complement this extended functionality with superior on-line help.

SPANNING THE NETWORK

The second major quality you should seek in a backup package is flexibility. Most administrators don't keep all of their important data on a single NetWare file server but spread it across multiple servers running different NOSs.

To back up heterogeneous networks you need client agents, small pieces of software similar to TSRs. The client agents handle communications with the server. Fortunately, for the most part, the products in this roundup let you back up both NetWare 3.*x* and 4.*x* servers, clients running Windows 3.*x*, Windows 95, Windows NT, OS/2, and some flavors of Unix, plus your Macs. All four work with both NDS and the Bindery on your NetWare servers.

It's not just about operating systems, though: You might have multiple storage-management products on the same LAN. For example, you might use ARCserve to back up your NetWare servers and Backup Exec to back up your Windows NT

ARCserve 6.0 for NetWare

This was not an easy decision—a couple of these packages are veterans that have continually been improved. We finally gave the nod to Cheyenne's ARCserve for NetWare. A perennial leader in the network backup market, Cheyenne continues to be an excellent choice.

PC MAGAZINE EDITORS' CHOICE

Past all the basics of backup and restore, which ARCserve executes well, this package gives you an arsenal of helpful features and utilities. These tools help you make sure you're doing everything right. ARCserve has a complete disaster-recovery routine, the Intelligent Loader, Cue Cards, and the Job Status Wizard.

We give an Honorable Mention to Arcada's Backup Exec for NetWare. Backup Exec has a remarkably easy installation and an excellent user interface. It also offers great flexibility in the number of clients it recognizes and its ability to read SIDF, MTF, and Cheyenne tape formats.

NETWORK BACKUP UTILITIES

How to Read the Suitability to Task Boxes

You need your backup package to be easy to use, compatible with your network setup, and quick at its job. Our Suitability to Task ratings will help you determine how smooth your backup and restore operations can be.

SUITABILITY TO TASK	
Product name	
Installation and configuration	Poor
Management and administration	Excellent
Compatibility	Poor
Performance	Poor

Our **installation and configuration** task reflects how easily a product can be installed onto backup servers right out of the box. We consider documentation and client and server installation programs, and we note how easy it is to interface with an existing tape drive. Products are also judged by how complicated they are to fine-tune once installed.

Management and administration ratings are based on a product's logging and error reporting, its alert options, and its ability to recover from system and operator errors. Ratings also reflect how effectively backup monitoring tools provide real-time client and server backup status. We also look at each product's ability to locate and restore files and to perform disaster recovery.

To assess a product's **compatibility,** we looked at its ability to work with key components in an existing backup system. To earn an excellent rating, a product must be able to perform complete backups of data and system files for a number of client and server types. We also consider how well the backup software works with tapes generated on other backup systems.

Performance ratings refer to raw speed—the throughput at which the package completes its backup and restore functions. Products with excellent ratings do not take significant delays for setup. They also employ effective compression schemes to speed file transfer.

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Performance Tests: Network Backup Utilities

Backup performance was generally uniform among these products, and the differences were not significant. The results on the Restore tests were more disparate, however—a finding that may be more important to network managers.

What the Numbers Mean

The backup times we recorded were comparable overall. Most administrators wouldn't be too concerned with the differences we found, which indicate discrepancies of 2 or 3 minutes during a 1GB backup.

On our Restore test, however, times were not uniform. The differences here are attributable to the products' restore engines. Some products, such as ARCserve, do lookups in a database on the server, which slows the process. Storage Manager goes a step further, also performing a preliminary hardware check.

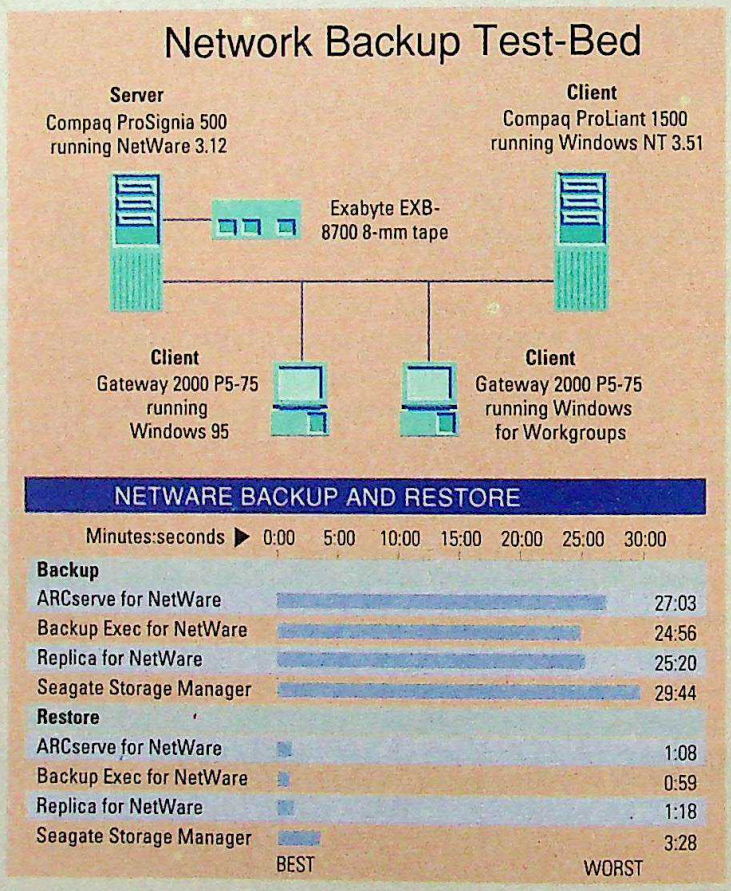
Fortunately, these delay times do not increase when you perform larger file restore operations.

Our first set of tests were timed backups. We ran each product through the backup process at least three times, using both a stopwatch and the product's log to arrive at final numbers.

In order to avoid skewed measurements, we turned off all verification tasks and reset the server and the test PCs each time to flush any cache from memory. We also started each test from PCs running Windows 95, Windows for Workgroups, and Windows NT (where applicable) to make sure that the desktop OS played no part in the end result.

Some products, including Storage Manager, seemed to take several seconds before they even sent the job to the server. We included that delay in our reported times, thus considering all of the time it took each product to complete a backup. If we had looked only at the time it took for the tape to write or read the data, we would have been testing the tape hardware, not the storage application.

—Analysis written by Steve Rigney



How We Tested

We installed each of the products on a Compaq ProSignia 500 with 40MB of RAM, a 4GB hard disk, and NetWare 3.12. The two administration PCs (not shown) were Gateway 2000 P5-75 PCs with 16MB of RAM each and 850MB hard disks.

Two of the clients were Gateway 2000 P5-75 PCs running Windows 95 and Windows for Workgroups. The third was a Compaq ProLiant 1500 with 40MB of RAM and a 4GB hard disk running Windows NT Workstation 3.51. Our tape device was an Exabyte EXB-8700 8-mm DAT drive.

Our testing data set consisted of several types of data files—including Word, Excel, graphics, database, and text files—ranging from 100 bytes to 5MB. The total size of our data set was 978MB. For our Restore operations we selected three database files that totaled about 5MB.

servers. In this situation, the ability to trade tapes across platforms and OSs is a necessity. While all of the products except Replica offer some measure of cross-compatibility, Backup Exec offers the best integration with different tape formats.

We were generally impressed with the products' ability to work with multiple tape devices and SCSI adapters. What's more, all of the products offer some way to ease your backup and restore tasks, such as add-on kits that let you use your autoloader or fast digital linear tape (DLT) device. Storage Manager even includes automatic tape rotations and HSM.

But occasionally some of these "time-saving" features can prove confusing. For example, Replica will not allow you to back up a single subdirectory or file; you must replicate an entire volume at a time. Storage Manager lets you choose single files and directories for backup, but its engine can take up to 7 minutes to tag all the files in a single directory. We would like to see vendors offer a simple, fast way to create a customized, ad-hoc backup job.

These products are powerful life-saving tools, and it's been fun to watch them become easier to use. Read on to find out which ones best suit your needs.

CHEYENNE SOFTWARE INC.

ARCserve for NetWare

ALL REVIEWS BY STEVE RIGNEY

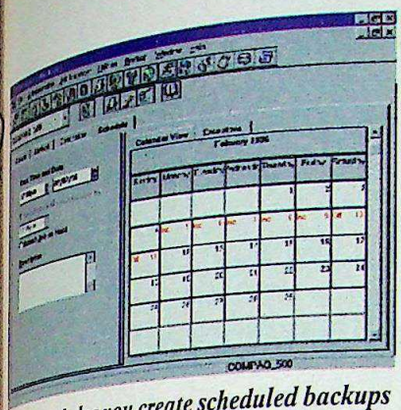
PC MAGAZINE EDITORS' CHOICE

This market leader for NetW... server backup is jam-pack... with features and comes wit... helpful 1,000-page manual. T... docs weren't necessary for inst... lation, but otherwise they'll serve you w... with this multifaceted product.

ARCserve 6.0 for NetWare offers co... plete disaster recovery and includes ... ability to read SIDF-compliant tapes, ... well as any media created using anot... Cheyenne product. Its performance w...

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ARCserve helps you create scheduled backups and restores, and keep a history of events.

keeping with the leaders here. This complete approach to backup earned it our Editors' Choice.

Similar to Backup Exec and Storage Manager, ARCserve ($1,895 list) allows you to back up all of your client PCs running OS/2, DOS, Windows 3.*x*, Windows 95, NetWare 3.*x* and 4.*x*. Client agents for Windows NT and Macs are available for an additional $495 each. Agents for different flavors of Unix are also available, starting at $495.

SUITABILITY TO TASK **ARCserve for Netware**	
Installation and configuration	Excellent
Management and administration	Excellent
Compatibility	Good
Performance	Good

The software is easy to install and includes about 100 different SCSI drivers. We especially liked a feature called the Intelligent Loader, which alerts you if one of the NLMs didn't load and offers a possible explanation as to why.

ARCserve is even ready in case you encounter any problems while installing it or using its features. Its Cue Cards walk you through a job setup, while the Job Status Wizard gives more detailed error code explanations and monitors an event's history or status. None of the other products offered similar help utilities.

Like Replica, ARCserve includes a disaster-recovery process that enables you to revive a failed server and restore your data. The method consists of creating several disks that reload your NetWare server with the necessary ARCserve NLMs and initiate a data restore.

ARCserve's administrative tools help you create scheduled backups and restores, keep a history of events, and track the location of your tapes at all times.

ARCserve is one of the most powerful storage-management platforms on the market, and it was among the fastest performers in our testing. It has dozens of great utilities and features that you can explore as you need to, and all of them are easy to navigate and use.

ARCserve 6.0 for NetWare. List price: single server, $795; enterprise edition, $1,895; client agents for Windows NT and Macintoshes, $495 each; Unix client agents, $495 and up. Cheyenne Software Inc., Roslyn Heights, NY.
(Indian partner Onward Technologies, Bombay.)

Network Backup Utilities

Products listed in alphabetical order	PC MAGAZINE EDITORS' CHOICE **ARCserve 6.0 for NetWare**	**Backup Exec for NetWare 7.01b, Enterprise Edition**	**Replica for NetWare 2.0**	**Seagate Storage Manager 4.0, NetWare Edition**
List price	Single server, $795; Enterprise Edition, $1,895	Single server, $695; Enterprise Edition, $1,395	Single server, $995	Single server: 25 users, $995; unlimited users, $1,995. Multiserver (unlimited users), $3,595
Client backup:				
Windows 3.x/Windows 95/Windows NT	○○○	○○○	○○○	○○○
OS/2, Macintosh, Unix	○○○	○○○	○○○	○○○
Backs up client/server	○○	○○	○○	○○
Backs up NetWare Bindery/NDS	○○	○○	○○	○○
Provides HSM	○	○	○	○
Performs scheduled backups	○	○	○	○
Tape formats supported	SIDF	MTF, SIDF	Proprietary SIDF	SIDF
Provides built-in tape rotation	○	○	○	○
Optional autoloader support	$695	$595	$595	$795 and up

ARCADA SOFTWARE INC.

Backup Exec for NetWare, Enterprise Edition

Need a backup utility that can handle different media formats? If the answer is yes, Backup Exec for NetWare is your choice. It reads SIDF and Cheyenne-formatted tapes, and reads and writes MTF tapes. (Fortunately, the most recent versions for NetWare and Windows NT also allow you to switch tapes between the OSs.) Backup Exec for NetWare 7.01 is a first-rate package with a good interface, easy install, and excellent performance.

ARCserve may offer more features, but Backup Exec's interface is simpler to learn. In fact, our only complaint with the interface is that you have to start multiple copies of the Backup Exec program if you want to perform multiple backup or restore jobs to different servers. Other packages, including ARCserve, allow you to launch multiple jobs as threads using a single session of the application.

Backup Exec lets you back up multiple client PCs running DOS, Windows 3.*x*, Windows 95, Windows NT, Unix, or OS/2, plus your Macs. The $1,395 enterprise version lets you back up an unlimited number of client PCs and NetWare 3.*x* and 4.*x* servers.

Similar to Storage Manager, Backup Exec requires you to perform part of its installation from the server console. You have to load several NLMs and know which type of SCSI adapter you are using for your tape device. Fortunately, the software ships on a CD-ROM, so you don't have to spend lots of time inserting diskettes. Although you can submit and monitor jobs directly from the system console, you probably should install the Windows-based Backup Exec manager. However, it is nice to be able to monitor and submit storage tasks directly from the server.

SUITABILITY TO TASK **Backup Exec for Netware**	
Installation and configuration	Excellent
Management and administration	Good
Compatibility	Excellent
Performance	Good

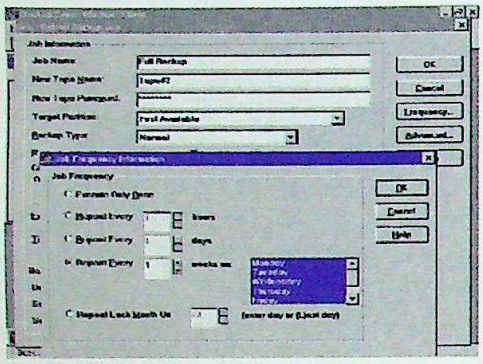
Backup Exec turned in the fastest results on our Backup performance tests, probably because of a complete rewrite of the engines for local and remote backups. Developers at Arcada say they did the rewrite expressly to improve performance. Backup Exec also does a good job

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of providing you with detailed logs and reports and can send an e-mail to the system administrator if a job fails.

With great performance and flexibility, as well as good compatibility across many



With Backup Exec, you can back up many different platforms with the basic package.

client and server platforms, Backup Exec for NetWare is a great backup solution. **Backup Exec for NetWare 7.01b, Enterprise Edition.** List price: $1,395. Arcada Software Inc., Lake Mary, FL.
(No Indian partner.)

STAC INC.

Replica for NetWare

This network backup package marches to the beat of a different drummer. Although Replica for NetWare 2.0 doesn't provide all the features that the other products in this network roundup do, it does offer a unique approach to protecting NetWare file servers that will appeal to some network managers.

The standard approach for backing up servers, used for years by the other products here, is to copy data file by file to a backup device, storing it in one of several tape formats; you then rely on the vendor's proprietary program to copy it back to your disk. Replica, instead, copies your NetWare volume object by object to a tape device or another NetWare volume or server, and you can use a DOS or Windows application to access the data.

It has some limitations. At present you can back up only NetWare 3.12 and 4.*x* file servers—no other NOS or client platforms. It has some basic utilities for reporting and scheduling unattended jobs, but that's it. You can't track tapes or use an automatic tape-rotation scheme.

SUITABILITY TO TASK

Replica for Netware

Installation and configuration	Excellent
Management and administration	Fair
Compatibility	Poor
Performance	Good

On the other hand, Replica was the easiest product to install and use. All you do is load a handful of NLMs and a simple Windows-based application that lets you choose the server you want to replicate and where you want to send the data.

One of our favorite Replica features is its method for disaster recovery. Using two diskettes that you create with Replica, you can revive a downed server. For just a file or directory restore, you can use a DOS or Windows app to access or copy the replicated data. We were able to recover data from a failed hard disk in under 10 minutes. You don't even have to run the Windows-based utility to find your tape and mount the volume: You can perform these tasks from the server console.

Since Replica writes objects, not files, to the media, it isn't currently compatible with any media formats on the market. You cannot swap media with any other storage products. The developers at Stac are trying to have their tape format incorporated into the SIDF standard, but currently only the proprietary media is available.

The ability to mount a backup tape as a NetWare volume and use any application to access it is refreshing. Replica is also fast. When Stac adds drivers for more platforms and increases the product's management capabilities, it will be a powerful storage-management solution.
Replica for NetWare 2.0. List price: single server, $995. Stac Inc., San Diego, CA. *(Indian partner Infosys Technologies, Bangalore.)*

SEAGATE SOFTWARE,
STORAGE MANAGEMENT GROUP

Seagate Storage Manager, NetWare Edition

If *more* is what you want, check out Seagate Storage Manager 4.0, NetWare Edition (formerly from Palindrome). It offers more network storage utilities than the other reviewed products. Storage Manager is a first-rate package, but it can be overwhelming, and its performance on our tests was down compared with the other packages.

For $1,995 you get full backup and restore for your NetWare 3.*x* and 4.*x* file servers, hierarchical storage management, data archiving, and the ability to back up all your PCs running any variety of Windows, DOS, OS/2, and Unix, p... your Macs. Storage Manager also in... cludes powerful tape-rotation schem... and a fairly intuitive interface. But, for e... ample, it should be easier to back up in... vidual files or subdirectories.

In addition, installing and configur... Storage Manager was not as easy as w... other products in this review. You have ... install and load a series of NLMs on yo... NetWare file server and then install t... management and configuration utility o... Windows-based client. On our test, we d... cided to use a client running Windows ... as the management station and NetWa... 3.12 on our server. Yet, we still had ... download and install the NDS client drivers on the management console, even though we didn't need them unless we were going to upgrade our servers to NetWare 4.1.

SUITABILITY TO TA...

Seagate Storage Manager

Installation and configuration	Good
Management and administration	Good
Compatibility	Good
Performance	Fair

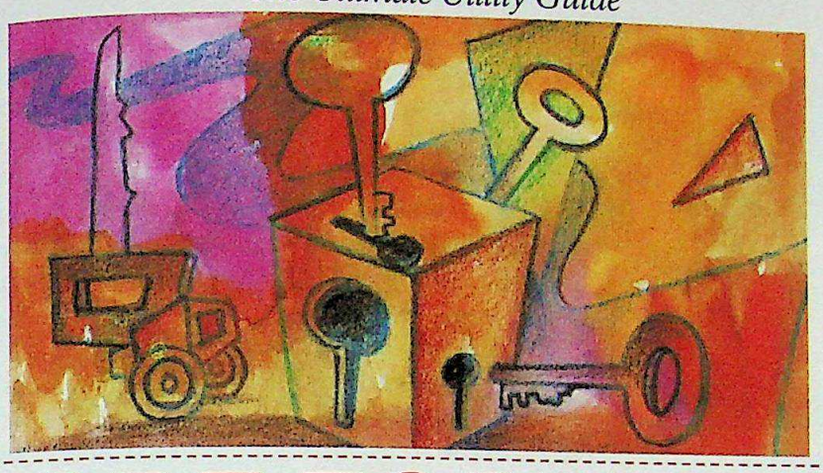
Storage Manager offers both the grat... father, father, son and the Tower of Ha... rotation schemes to guarantee that all ... your data is stored in several locations ... once. But the package seems to rely t... heavily on these schemes. That is, it's h... to create a custom backup job. You m... disable the tape rotation and use the F... Manager utility to select each file you w... to back up. There is no easy way to tag ... files in a NetWare volume or subdirecto...

The Storage Manager user interface ... good but requires some time to master. ... has some good built-in scheduling optio... unattended backup, archive, and aft... hours data migration. Storage Mana... also offers powerful reports for keep... track of all of your storage jobs.

No other product in this review has ... tape-rotation features that Storage M... ager does. Its performance was not ... keeping with the other packages he... though, and we would like to see the n... release offer better flexibility for creat... customized jobs. □
Seagate Storage Manager 4.0, NetWare E... tion. List price: single server, $1,995; m... tiple servers, $3,595. Seagate Softwa... Storage Management Group, Naperv... IL. *(Indian partners Magic Technolog... New Delhi; Pioneer Network Soluti... Bombay.)*

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MORE ESSENTIAL PROBLEM SOLVERS

CALL THEM ESOTERIC, CALL THEM NICHE-MARKET, BUT THE TOOLS WE'VE PROFILED HERE TACKLE A BROAD RANGE OF SYSTEM AND PERFORMANCE ISSUES.

By David Haskin

If you want to pinpoint Windows 95's greatest shortcomings, look for the utility categories with the largest number of products. For example, computer viruses will probably always infect our PCs, and Windows 95 offers little or no help finding and removing them. As a result, third-party antivirus products abound. Similarly, while the new operating system's desktop is clearly superior to Windows 3.1's, a large number of new or updated desktop enhancers are trying to fill Windows 95's more noticeable gaps.

Other sections of this roundup feature the more crowded utility categories. But many useful and popular utilities for Windows 95 are not easily pigeonholed into specific categories. A summary of some of the best—or at least the most distinctive—of the uncategorizable utilities follows.

If you are a chronic downloader, often trade large files with coworkers and friends, or are simply seeking some way to clear some of the file clutter on your hard disk (without discarding it all), you need a file compression/decompression utility. Such utilities can create new .ZIP files, open existing ones, and help you track the ones you have. They even let you add and subtract files from zipped archives.

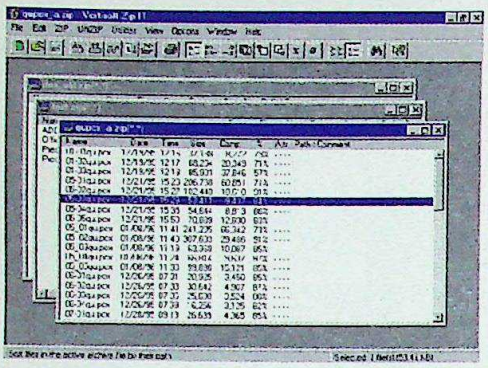
Zip-It 3.0 ($69.95), from Vertisoft Systems Inc., lets you use any of nine different compression algorithms; each offers a different trade-off between compression size and speed. It can create .ZIP files that span multiple disks and self-extracting files that you can expand without the use of a compression program. It also can test the integrity of compressed files and require passwords to alter or uncompress them.

Handily, Zip-It adds a compression option to the pop-up menu that appears when you right-click a file name in the Windows Explorer or in a Windows application's Save As and Open dialog boxes. You can search for filenames within compressed volumes and run programs without first decompressing them.

Zip-It supports Windows 3.1 and Windows 95, making it particularly useful in mixed environments. While it fully supports Windows 95 tricks like long filenames, its interface could use an update. For example, it has no dialog boxes that pop up with right mouse clicks, and its common dialog boxes resemble those in 16-bit applications. Also, wizards would be useful to walk you through the process of compressing and uncompressing files. As it is, you must wade through a series of

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Zip-It is a powerful, flexible tool for creating and viewing compressed files.

dialog boxes to perform common functions like creating new .ZIPs.

PKZIP for Windows ($49), from PKWARE, doesn't yet support long filenames, which is a significant inconvenience for Windows 95 users. A 32-bit version is expected in late summer.

This program, however, is still far easier to use than the classic PKZIP utility, which featured arcane command line switches that have bedeviled PC users for years. That frustrating complexity has been replaced with a typical Windows interface for creating and decompressing zipped files. First you name the compressed file, then you select the files to add to it. You can add files from multiple directories, although this part of the interface is convoluted; you must call a second dialog box from the first dialog to do this.

After you create compressed files or obtain them from other sources, you can view their contents. You can sort the file list, add or subtract files from it, and launch individual compressed files without uncompressing them first.

Compared with the other products, PKZIP for Windows has relatively few bells and whistles. It can't, for example, check the integrity of compressed files. There are no right-mouse-click options, and it provides only five different levels of compression.

WinZip 6.0 ($29), from Nico Mak Computing, solves several of these problems. Most notably, it provides a wizard for unzipping files, which makes it ideal for computing neophytes.

WinZip has the strongest Windows 95 look and feel of these three products and is the easiest to use. Like Zip-It, WinZip can build its compression capabilities into pop-up menus in the Windows 95 Explorer. However, unlike Zip-It's Windows 3.1–like dialog boxes, WinZip's dialog boxes and other interface elements look as if they were built for Windows 95. As with Zip-It, you can compress data files with long names and keep those names intact. You also can give your .ZIP files long names.

You can view the contents of compressed files or you can check out individual files, or uncompress them to specified directories. Like PKZIP, it offers five types of compression, compared with Zip-It's nine. You also can check the integrity of .ZIP files, and create self-extracting compressed files and .ZIP files that span multiple floppy disks.

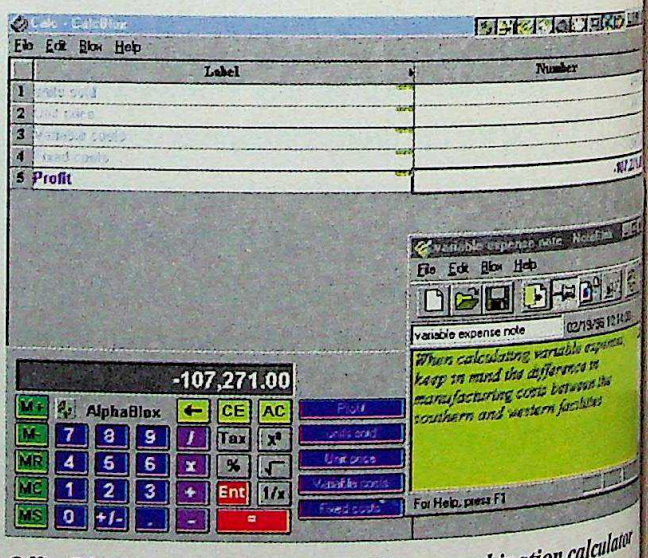
All three programs delivered about the same compression performance. We compressed 13 bitmapped images that required just over a megabyte uncompressed. Using the software's tightest compression options, PKZIP did the best, creating a 314K .ZIP file. WinZip created a 315K .ZIP file, and Zip-It required 322K.

OfficeBlox 1.0 ($69.95), from AlphaBlox U.S., falls even further into the uncategorizable group. Nevertheless, this handy interconnected set of utility modules offers several excellent application enhancers.

OfficeBlox consists of four named application modules. ListBlox is a datasheet-like utility for creating text lists, NoteBlox creates freeform notes that resemble on-screen sticky notes, and CalcBlox is a combination spreadsheet and calculator. These mini-applications are useful but hardly unique. What makes this utility collection powerful is its fourth module, ToolBlox, and its use of OLE 2.0. ToolBlox is a toolbar that lets you launch each Blox module as a standalone application by double-clicking its icon. You can customize ToolBlox by adding icons for launching any application you want.

More interestingly, though, you can add a Blox object by dragging its icon from ToolBlox to your desktop or to an application that can serve as an OLE container. Double-clicking on an object embedded in an application launches the OLE edit-in-place capabilities; the container application's menus and toolbars change to those of the Blox object. This enables you to embed a NoteBlox object that explains a specific calculation in your spreadsheet. Or you can keep a Blox object on your desktop, a good spot for to-do lists and other items you reference regularly. You can even embed one Blox object within another, such as a NoteBlox item that provides details about a specific task in a ListBlox to-do list.

Though none of the Blox modules will replace more full-featured products such as spreadsheets and word processors, they have a reasonable amount of power and load quickly. NoteBlox features find-and-replace capabilities and time and date stamps. ListBlox includes sorting capabilities and ODBC-compliance for easily importing external databases. And each Blox application comes with dozens of templates for specific tasks. For example, one ListBlox template serves as a weekly calendar, and one Calc-



OfficeBlox's modules include CalcBlox, a combination calculator and spreadsheet, and NoteBlox, designed to create Post-it type notes.

Blox template calculates a return on investment.

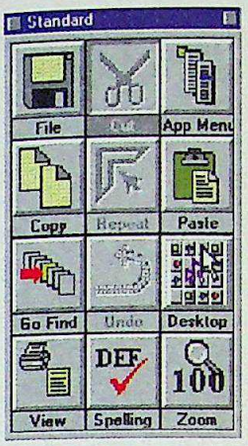
ClickFlick 1.5 (49.95), from MiraTech Corp., acts as a cross between a desktop enhancer and a macro utility. If you click your right mouse button while holding down some combination of the Alt, Ctrl, or Shift keys

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a customizable toolbar called a PopBox appears. Each PopBox has icons for launching often-used functions.

PopBoxes are context-sensitive. If, say, you're working in Microsoft Word for Windows, you can summon PopBoxes dedicated to specific functions like formatting. You can also nest PopBox icons: Clicking on the justification icon in Word for Windows' formatting PopBox leads to other icons for left, center, and right justification. ClickFlick comes with PopBoxes for many popular applications, and you can also create your own.

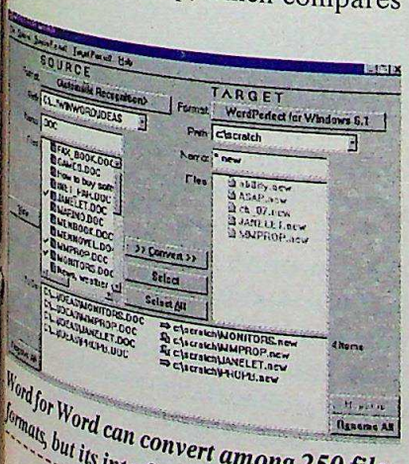


ClickFlick displays application-specific toolbars for fast access to common functions.

ClickFlick desperately needs wizards to simplify the roll-your-own customization process. Besides the clumsy configuration process, we also found a few pre-created ClickFlick buttons that didn't work as advertised on our test system. The center alignment button in Word for Windows, for example, just highlighted a selection.

Even so, once you finally set up ClickFlick to work the way you want, it can make your computing life a lot easier and faster. By the time you read this, MiraTech should have released a new version of ClickFlick that includes a batch language.

Word for Word 7.2, the granddaddy of file conversion utilities, is now part of the Adobe File Utilities 1.0 ($149) which should be shipping from Adobe Systems by the time you read this. This collection of utilities will also include Viewer95 (a file viewer utility formerly from Master-Soft), and DocuComp, which compares two versions of a document.



Word for Word can convert among 250 file formats, but its interface is confusing.

This latest version of Word for Word includes most of the file conversions added to the program through the years: It converts 250 formats, including 30 graphics file formats. If you want to convert a Peach Text document to Navy DIF, this program will fulfill your needs. It also converts more common PC and Macintosh formats.

Word for Word's conversion process is fast, but not as intuitive as it could be. After selecting the files you want to convert in one window, filenames then confusingly appear in two other windows. One window displays the file name of the converted file and the other simply lists all the conversions from which you can choose. The remaining steps for converting documents aren't exactly intuitive; the overcrowded interface, which remains largely unchanged from previous versions, needs an overhaul.

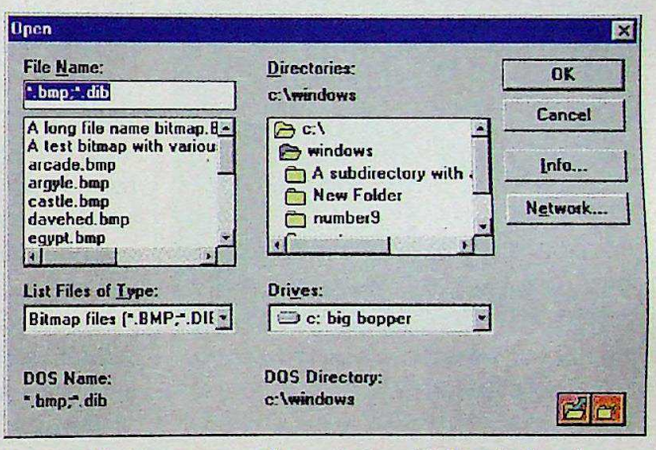
Word for Word does, however, offer some handy convenience features. You can view a file before the conversion and you needn't select the file format of the original document, as Word for Word automatically detects the format. We found the conversions generally accurate but not always flawless. For example, text and heading and footer styles in Word for Windows documents translated perfectly into Ami Pro and WordPerfect for Windows. When translating to Ami Pro, one paragraph style that originally had double spacing between paragraphs converted incorrectly to single spacing.

Word for Word doesn't provide detailed control over image format conversions such as color correction. For that, graphics aficionados must either use an image editor after the conversion or a product that specializes in graphics conversions, such as **HiJaak 95** ($49.95), from Quarterdeck. Even after all these years, though, Word for Word still comes through with lots of reliable format conversions.

Speaking of conversion, if you converted to Windows 95 but still use Windows 3.1 applications, you can't benefit from the new operating system's support for file names as long as 255 characters unless you use either **Long File Names 4.0** ($49.95), from VIEW Software, or **Name-It 1.0** ($59.95), from Vertisoft Systems.

These programs take different approaches to retrofitting Windows 3.1 applications with support for long file names. A 16-bit application, Long File Names works in both Windows 3.1 and Windows 95. Though it's transparent and flexible, it's also somewhat clumsy.

After installation, Long File Names alters a 16-bit application's Save As and Open dialog boxes so you can type and view long filenames. Then it stores those long filenames in its own internal database. On the one hand, this makes Long File Names simple to use because it merely alters existing dialog boxes. However, this approach also means that it takes a moment for the dialog box to appear, while Long File Names refers to its own database of names. By contrast, Name-It uses Windows 95's native VFAT for its file name listings.



Long File Names retrofits existing 16-bit dialog boxes to display long filenames.

Also, you may have trouble reading Long File Names' altered dialog boxes. Because dialog boxes in Windows 3.1 applications aren't designed to display long file names, Long File Names adds a horizontal scroll bar to the filename field.

Some may find a scroll bar annoying to use for viewing long filenames. Even

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though Long File Names supports names as long as 255 characters, only the first 24 or so of those characters can appear in the dialog box at the same time; then you must use the scroll bar. On the plus side, Long File Names adds two new buttons to the old Open, Save, and Save As dialog boxes. One button launches Windows 95 Explorer or Windows 3.1 File Manager, and the other lets you create new folders or subfolders with long names.

Name-It is a 32-bit application that only works in Windows 95. If a 16-bit program uses common dialog boxes, Name-It automatically displays its own Save, Save As, or Open dialog box, which closely resemble those in most Windows 95 applications. If a program doesn't use common dialog boxes, Name-It adds a button to the existing dialog that leads to its own. This approach provides a more consistent look and feel with other 32-bit applications than Long File Names.



After Dark provides extensive control over your screen blanker.

Despite their differences, both programs worked well in our tests. They not only create and read long file names, but they also display long filenames you create using 32-bit programs. Neither program is a total solution. Because they only work with Save, Save As, and Open dialog boxes, they can't help a DOS or Windows 3.1 compression utility compress files and keep long file names intact.

While Windows 95 print capabilities are superior to those in Windows 3.1, color printing remains a slow process. **ColorFast** ($89.95), from LaserTools Corp., tries to rectify that problem for color ink jet printers by providing its own print drivers.

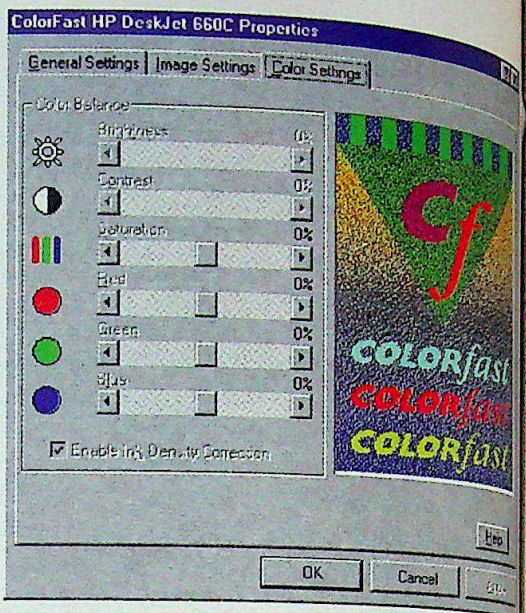
ColorFast's results vary depending on your printer, the item you're printing, and the application from which you're printing. For example, with a HP DeskJet 660C and the standard driver obtained from HP, one page color flow chart created by in CorelFlow took 2 minutes 42 seconds to print; ColorFast needed 2 minutes 51 seconds. Printing a 150K photograph saved in JPEG format (using Microsoft Explorer) took 2 minutes 50 seconds for both ColorFast and the normal HP driver, and a gray-scale page from a Microsoft PowerPoint presentation needed 4 minutes 23 seconds with both drivers.

When it printed a color PowerPoint slide, however, ColorFast bettered its time. The standard driver required 4 minutes 11 seconds, while ColorFast required just 3 minutes 40 seconds. Also, when we used the older driver that came with Windows 95 for the similar HP 560C, ColorFast printed 10 to 30 percent faster for all tasks. LaserTools claims that such speed improvements are the norm.

Besides attempting to speed color printing, ColorFast provides simple controls over the printer's output of color and halftones. But because LaserTools designed ColorFast for nonartists, it doesn't substitute for true color calibration that matches screen colors to printer output.

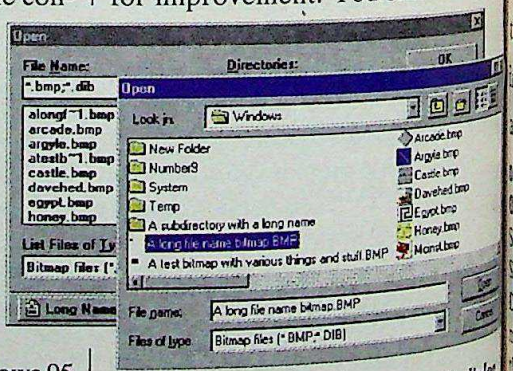
Let's face it: Nobody will ever call **After Dark for Windows 95** ($30), from Berkeley Systems, an essential utility. Even though Windows 95 comes with some decent screen savers, After Dark remains the gold standard for screen savers, and arguably the most fun. This version has 45 enjoyable screen savers—15 more than before—that range from the classic Flying Toasters to Flying Toilets and Boris the Cat.

Besides adding Windows 95 compatibility and new screen savers, relatively little has changed in this upgrade. The After Dark control panel still enables you to configure the screen savers and determine, for example, whether they should include sound effects and how many elements (toasters, for example) should appear on-screen. Also as before, After Dark includes a handful of other useful capabilities. Most notably, its Eco Logic feature enables you to use your monitor's power-down capabilities even if your video adapter doesn't support that feature.



ColorFast provides replacement drivers for your color ink jet printers that include color correction capabilities.

While After Dark works reasonably well with Windows 95, there's still room for improvement. You still must load



Name-It provides Windows 95–style dialog boxes in Windows 3.1 applications.

from your Startup folder or from the LOAD= line in your WIN.INI file, which requires system resources and clutters your Taskbar. A proposed solution: Berkeley should simply build After Dark into the Screen Saver tab of Windows 95's Display Properties dialog box. □

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OS/2 UTILITIES

FOR ALL THAT SETS OS/2 WARP APART FROM WINDOWS 95, ITS UTILITY NEEDS ARE QUITE SIMILAR. OS/2'S OBJECT-BASED DESKTOP, BACKUP, AND MEMORY ARE ALL PRIME UTILITY TARGETS.

By Esther Schindler

There is a popular myth that contends that few mainstream OS/2 applications—let alone utilities—are available. Attempting to describe the top OS/2 utilities in the allocated space quickly disproves that theory. As with every other operating system, OS/2 offers an abundance of utilities that enhance or tune systems running OS/2. But no operating system is perfect; accordingly, several companies have written indispensable utilities to smooth away the rough edges and fill the gaps in OS/2.

DESKTOP ENHANCEMENTS

Object Desktop ($89.95), from Stardock Systems, is a collection of Workplace Shell improvements. Some of Object Desktop's features make the desktop more attractive, but the program is more than just a pretty face.

Object Desktop replaces OS/2 Warp's Launchpad with a more efficient Tab Launchpad, which takes up less screen space. A Control Center gives you virtual desktops, easy access to oft-used desktop objects, and niceties like a digital clock and CPU monitor. Archived files appear as desktop folders; Object Desktop unzips them and lets you view zipped files on the fly. Even better, you can launch programs from within .ZIP files and treat anything in a .ZIP file as an ordinary desktop object. The program also includes a superb file navigator, folder caching, a better text editor, one-click close, and dozens more features, both minor and major.

DeskMan/2 Productivity Pack ($99.95), from Development Technologies, offers another suite of desktop enhancements. Less splashy than Object Desktop, DeskMan/2 crawls under the covers of the operating system, giving you control over the way your system works and helping you recover from desktop disasters. DeskMan/2 makes it easy to backup and recover the desktop, as well as to control the desktops of individual or networked OS/2 users. You also get a virtual desktop manager, VUEMan/2, REXX and CID support, and configuration snapshot utilities. Its tool suite lets you delete "undeleteable" objects (and not restore them), personalize desktops, and selectively or globally control object styles, menu items, and WPS capabilities. DeskMan/2's utilities might appear as unexciting as a screwdriver, but you'll find them equally as indispensible.

Desktop Observatory ($179), from Pinnacle Technology, is one example of several OS/2 utilities that specialize in enhancing the limited security built into the Workplace Shell. (DeskMan/2 provides most of these features, too, as do Syntegration's Secure Workplace and Racal's PC-Guard. They vary in implementation, sometimes in major ways, but the purpose remains the same.) Desktop Observatory lets you restrict the behavior of objects; for instance, it can prevent you from deleting, copying, or renaming them. You can password-protect objects and create new desktops over the network.

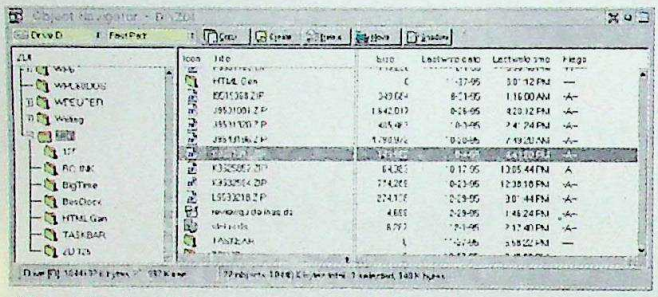
Desktop Commander ($59), a lighter

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version of Desktop Observatory, has no logging, auditing, or password support. The company's **KidProof/2** ($59) is a version customized for home users, so that each family member can have his own desktop (and the kids can't delete Mom's work folder by accident).

You'll find plenty of small treasures in OS/2 desktop enhancement utilities as well. For instance, **XIT 2.0** ($15), from CodeSmith (*http://www.wilmington.net/bmtmicro/catalog/xit.html*), adds the ability to "roll up" an application so that just the title bar appears on the desktop. At its low price, the simple and useful XIT is an excellent value.



Object Desktop has a gaggle of WPS enhancements, from the custom-tailored appearance to the improved Tab launchpad.

ANTIVIRUS

Viruses are much less of a concern under OS/2 than in other operating systems, as the same memory management found in OS/2 that keeps errant but well-meaning applications from eating up RAM or resources belonging elsewhere in the system also keeps malicious viruses from stomping on your system. However, some viruses can still affect OS/2 systems, especially those that chomp on the boot sector. A handful of OS/2 antivirus programs are thus available, all of which work similarly to their DOS and Windows brethren: AntiVirus/2 ($49), from IBM Corp., Dr. Solomon's Anti-Virus Toolkit ($125), from S&S Software International; and VirusScan for OS/2 ($65), from McAfee Associates.

BACKUP

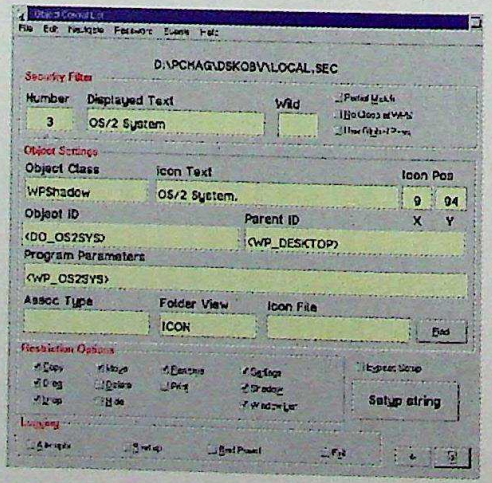
Native OS/2 backup software is especially important for OS/2 users, because DOS backup programs won't support OS/2's long file names or extended attributes.

The user interface on **BakUpWiz** ($149), from PCX, is only text-mode, and you won't be awestruck by its beauty. That might not matter to you, since backup software often runs from a scheduler or command line anyway. BakUpWiz is reliable and blindingly fast (the fastest of all we tested), and the company claims it will work with nearly any SCSI device.

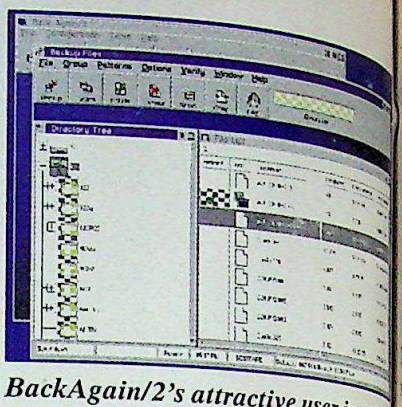
Back Again/2 Personal and **Professional** ($49 and $149, respectively), from Computer Data Strategies, also support SCSI devices and share a much more aesthetically pleasing interface. They also work more elegantly with the Workplace Shell. For instance, to back up a directory or drive, you can drag it and drop it on the Back Again/2 device and the backup will begin immediately; if you're unsure of what to do, you can right click to see a menu. Back Again/2 supports floppy disk and logical drives.

BackMaster ($89.95), from MSR, provides support for QIC 40/80/3010/3020 format drives including QICwide, Travan, and parallel tape drives. BackMaster also supports a few SCSI devices. We tested BackMaster with an Iomega Ditto drive and found it friendly and straightforward.

DualStor ($55), from IBM Corp., also provides support for QIC/80 format drives, but it also has its own tape format. The DualStor format lets you erase any backup set on the tape (not just the last one), and permits a Restore to begin in the middle instead of the first tape in the series.



Desktop Observatory lets you restrict the behavior of desktop objects.



BackAgain/2's attractive user interface follows OS/2 drag-and-drop rules.

MEMORY MANAGEMENT

Dozens of applications help you optimize system parameters, from cache size settings to performance monitoring tools. **Performance Plus** ($39.95), from Clear Simple, has several optimization utilities as well as a short book that explains what performance tuning is all about. The Optimize tool recommends modifications to your CONFIG.SYS, which you can adopt or ignore. You then use Performance Plus's simple benchmark test program to see what effect the changes had.

PM Patrol 4.0 ($25) from WallyWare is a resource monitor that displays a status line at the bottom of the screen, shows the current status of many of your system parameters. It keeps track of nearly everything in your system, reporting information on things such as processes, threads, DLLs, and drivers. PM Patrol monitors events and notifies you of changes in resource usage.

CPU Monitor Plus ($129.95), from BonAmi, a system monitor and analysis package on steroids, gathers statistics about memory usage, CPU time, process IDs, idle time, and thread status. It logs activity from serial ports and hard disks. It lets you dynamically change process priorities and kills runaway programs.

UNINSTALLERS

Although OS/2 applications can be just as rude and invasive as applications for other operating systems, the only entry in the uninstaller category is **Unimaint** ($99), from SofTouch. To get rid of an application, you drag and drop the program object to the Unimaint Uninstaller, which explores

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your system to find out where the data files are kept, removes any program references in the .INI files, unregisters associated nonstandard Workplace Shell classes, and so forth. It confirms everything with you before making the actual deletion.

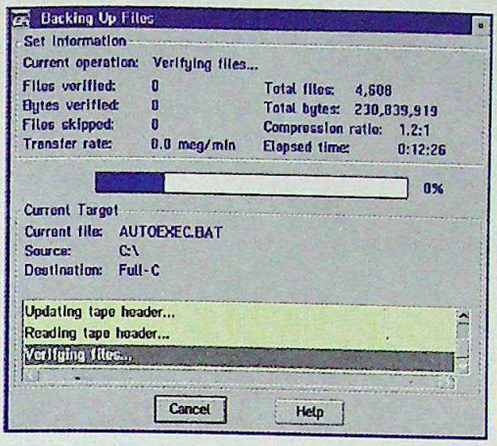
FILE MANAGER REPLACEMENTS

The OS/2 Drives object would probably land low on any list of "favorite OS/2 features." It's awkward and nonintuitive. Fortunately, there are alternatives.

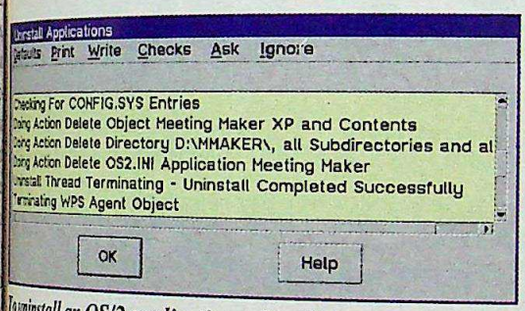
FileStar/2 ($79), from SofTouch, a fast and functional text-mode application with a minimum of bells and whistles, delivers what it promises without a lot of complications. It includes extras like system status updates and a zipper.

Depending on your viewpoint, you'll find **FM/2** ($40 personal edition, $80 commercial edition), from BareBones Software, to be the kitchen sink of OS/2 utilities—either feature-rich or overly complex. It has a unique container feature that lets you temporarily group objects so that you can work on them later.

Other OS/2 utility suites incorporate useful file management features. For instance, Stardock's **OS/2 Essentials** ($39.95) includes DirMaster, a practical if unassuming file manager. Stardock's Object Desktop also includes an excellent file manger.



DualStor has library functions that store the name, tape location, and history of your files.



To uninstall an OS/2 application using Unimaint, just drag and drop the program to the application window.

DISK UTILITIES

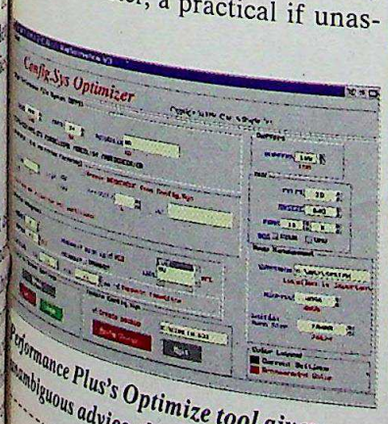
It's amazing that the computer industry managed so long without **PartitionMagic** ($69.95), from PowerQuest. PartitionMagic lets you change the size of your hard disk partitions on the fly without destroying data. You can add, delete, resize, or format partitions. When you resize a FAT partition, PartitionMagic resizes the clusters, which can recover wasted hard disk space. Of particular interest to OS/2 users, PartitionMagic can convert a partition from FAT to HPFS without the tedium of backing up, reformatting, and restoring your files.

SWISS ARMY KNIVES

Several companies have created utility suites replete with OS/2 system utilities. Perhaps the best known is **Gammatech Utilities** ($99), from SofTouch. These utilities include an undelete superior to the one included with OS/2 Warp, optimizers for FAT and HPFS volumes, a disk sector editor, partition repair tools, and more.

The Graham Utilities ($93), made by WarpSpeed Computers and sold by Development Technologies looks and acts very much like an earlier version of Norton Utilities. The package's functions include a batch enhancer, remote disk management tools, Unix-like tools such as uuencode and grep, and system diagnostics.

Stardock's OS/2 Essentials would be better described as an OS/2 starter kit. In addition to the file manager capabilities already mentioned, it includes Filebar (a status/shortcut line at the bottom of your screen), Filegraph (which shows your disk usage graphically), a screen saver, and a trashcan.



Performance Plus's Optimize tool gives unambiguous advice about system changes.

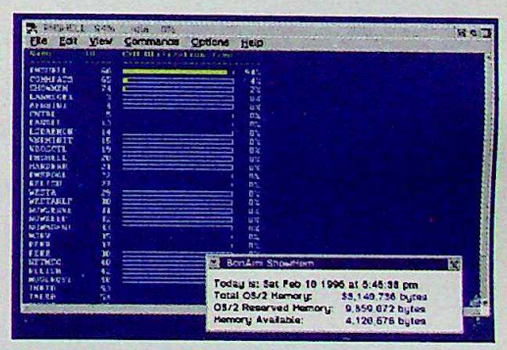
"BUT WAIT, THERE'S MORE!"

If you're still a command line junkie, you probably discovered **4DOS** ($69), from JP Software. 4DOS's sister program, **4OS2** ($69), replaces OS/2's CMD.EXE, and it's irreplaceable to those who like to type in a command window.

Adding fonts in OS/2 is awkward and slow. **FontFolder** ($20), from Cliff Cullum (on CompuServe: OS2BVEN, Library 1), improves the process and supports font libraries, so you can quickly swap collections of fonts in and out of your system.

The major weakness in OS/2's HPFS is that it's invisible from DOS. **AMOS** ($33), from Allen Mertner (on CompuServe: OS2BVEN, Library 1), lets you read (but not write) HPFS files when you're in DOS, so you can have the best of both worlds.

If you want disk compression utilities, you have two choices. The most well-known is **Stacker** ($149) from Stac, but it only supports FAT drives. **DCF/2** ($99.95), made by Proportional Software (and, like The Graham Utilities, sold by Development Technologies), supports HPFS as well as FAT. It also permits virtual disk units, so you don't have to compress a complete partition.



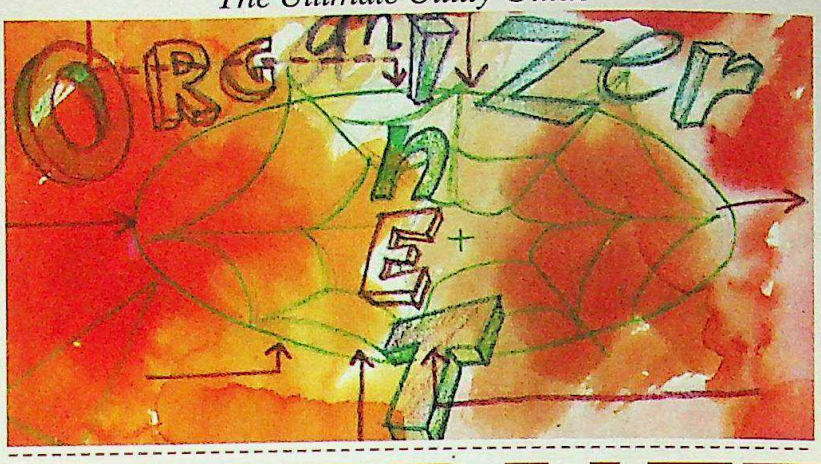
CPU Monitor Plus displays a running check on system activity.

To explore OS/2 utilities further, visit the Internet site "OS/2 Must-Have Utilities And FTP Links" at *http://www.os2.hammer.org/OS2*. □

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The Ultimate Utility Guide



INTERNET ORGANIZERS

WE TEST NINE UTILITIES THAT HELP YOU ORGANIZE THE INFORMATION YOU'VE FOUND ON THE WEB AND STAY ON TOP OF THE LATEST UPDATES.

By Edward Mendelson

Internet organizers are designed to supplement or replace the relatively simple bookmarks or Favorites menu in your browser. They range from simple address-book utilities to elaborate programs that can report changes on some or all of the Web sites of your choice listed in your bookmarks menu or Internet shortcuts. Some of these utilities not only tell you that a Web site has changed but show you the changed text itself. Others tell your browser to jump to a Web site as soon as you click on its name in the organizer; still others create HTML pages containing sets of links that you can load into your browser. Some simply make you copy an address from the utility and paste it into your Web software manually. As with all utilities, too many features can be worse than too few if they make the interface confusing and the program slow to load. But the right one can greatly increase your ability to glean information from the Web. Our roundup of nine can point you to the one that suits your needs.

CLEAR SOFTWARE INC.

Clearweb

Clearweb 0.4, a Netscape Navigator helper application, is a powerful bookmark utility that can help you get a grip on complex Web sites. Its editor lets you create and maintain a hierarchical organization for bookmark files, while its viewer displays site contents in a clear graphical map format. Clearweb, currently in beta testing, is available for free download. Once it ships, the editor will cost $49; the viewer will be free.

The editor has two components: an outline editor and a map editor. The outline editor makes it easy to edit your bookmark files, which are displayed in a hierarchical tree format. You can import a bookmark file and redesign it, or you can start from scratch using Clearweb to capture Web pages and hyperlinks. Editing is easy, using either cut-and-paste or drag-and-drop. The map editor is best used for altering the size, shape, and color of map elements. When you are finished, anyone with the Clearweb viewer will be able to view your bookmarks and launch pages. If you want to export your bookmarks into an HTML document to view within your browser, you need the editor.

The beta version of Clearweb we tested still showed some rough edges. It has limited shortcut key support, and some of its functions were not particularly intuitive. But its impressive tools give

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Internet Organizers

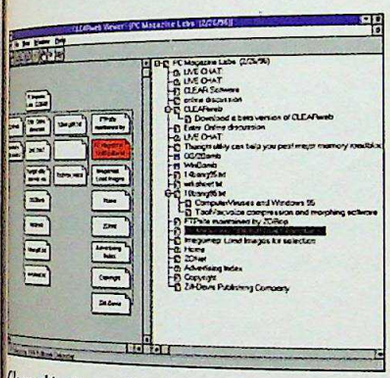
	Clearweb 0.4	KnowIt All 1.0	NetBuddy	Netscape Smart-Marks 1.0,* Smart Bookmarks 1.0	Surfbot 2.0 (PC MAGAZINE EDITORS' CHOICE)	Surfer Central 1.21	URL Grabber 95	Vizion Web-Special 1.2	Webodex Organizer
Automatically sorted in alphabetical order	○	○	○	○	◑	○*	◑	○*	○
Grabs URL from browser	○	○	○	○	○	○	○	○	○
Sends URL to browser	○	○	○	○	○	◑	◑	◑	◑
Tree-structured site list	○	◑	○	○	○	◑	○	◑	◑
Exports site list in HTML	◑	◑	○	◑	○	◑	◑	◑	◑
Full-time page viewer									

*Works only with Netscape Navigator.

what you need to create and manage bookmark files and to display them in a clear, fun, and intuitive way as maps.

Clearweb 0.4. List price: Viewer, free. Editor: beta free for download; final, $49. ClearSoftware Inc., Newton, MA.

(No Indian partner.)



Clearweb's viewer clearly maps Web sites.

GRASP INFORMATION CORP.

KnowIt All

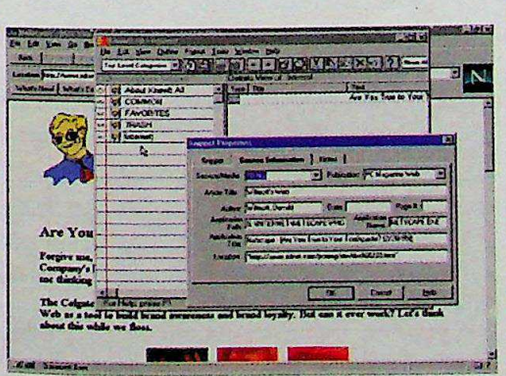
Grasp Information Corp.'s $99.99 KnowIt All 1.0 can be used as an Internet organizer, but that's only a small part of its main function: to serve as a database for any snippet of text you select in virtually any Windows application. KnowIt All works in two modes: Minimized, it turns into a small toolbar, with icons representing the categories in which you want to store your snippets. In full-screen mode, it offers either an expandable outline, a sticky-note metaphor, or a more formal bulletin-board interface to display the content of the snippets. (Full-screen mode doesn't really require the entire screen, just an expanded window.)

After you select text in an application like your Web browser, you click on an icon on KnowIt All's toolbar to store the selected text. The utility automatically stores the URL of the source page, but you have to enter the title and other information by hand. Later, if you highlight the snippet in full-screen mode, you can use either the right-click menu or a top-line menu command to jump to the URL in Microsoft Internet Explorer, Netscape Navigator, or Spyglass Enhanced Mosaic (one of which has to be running for this trick to work).

The utility doesn't try to support FTP sites or other Internet resources that you can't access from your Web browser, and you'll have to select some of the text on a browser page before you can transfer the URL into KnowIt All. But the program does provide a uniquely simple way to jump between the data that you have collected on the World Wide Web and the source of that data. This is the kind of utility that, much like the DOS-based Lotus Agenda, will give you maximum effectiveness only if you're willing to put virtually your entire life into it. Still, no other program stores Web-based information in such an efficient and effective manner. PC Labs tested a beta version of KnowIt All; the shipping version should be available by the time you read this.

KnowIt All 1.0. List price: $99.99. Grasp Information Corp., Farmington, CT.

(No Indian partner.)



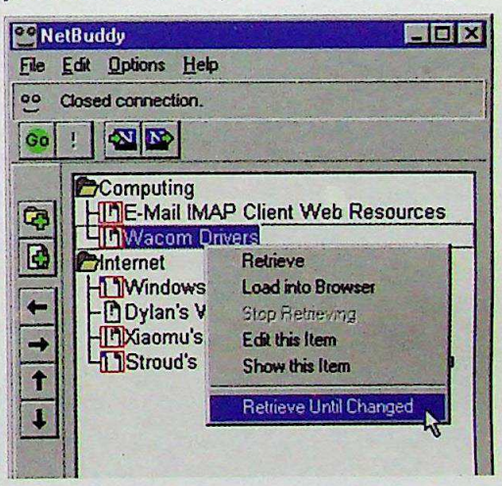
KnowIt All: for grabbing and categorizing.

INTERNET SOLUTIONS INC.

NetBuddy

PC MAGAZINE EDITORS' CHOICE

This high-quality freeware utility from Internet Solutions alerts you when there's been a change to any of the Web pages in which you're interested. The compact main window displays the pages you want to monitor, and, when you tell NetBuddy to check for changes, it scans each page and changes the icon next to the name of the page if anything has changed. A mouse click displays the page in NetBuddy itself, either in plain-text format with the changes highlighted or, if the page is a graphic (like a weather map), as a .GIF file. NetBuddy is much faster than your browser, and you don't need to open



NetBuddy's list of monitored pages.

your browser at all to view the pages, although a button or keystroke will launch your browser and jump to the page if you want to see it in formatted form or follow any of its links.

You choose the pages you want to monitor by importing your browser's hot list, or by clicking a button that automatically inserts the name of the page currently displayed in your browser. (This last feature wasn't entirely reliable with Netscape 2.0: When we clicked on the but-

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ton that's supposed to grab the page currently in the browser, NetBuddy often launched another copy of Netscape instead.) The list of monitored pages appears in a tree-style outline that you can easily reorganize with toolbar buttons. You can tell the program to check individual pages or folders for changes at different intervals; you can even tell the program to continue hammering at a page until the page changes.

NetBuddy gives you all the help files you pay for—meaning that there's no help at all except for some laconic tool tips. But a few minutes of experimentation is enough to learn all its features. Except for its minor problem with grabbing currently displayed pages, NetBuddy, a 16-bit Windows program, is elegant, compact, and far better designed than most of the utilities for which you have to pay.

NetBuddy. List price: Free. Internet Solutions Inc., Seattle, WA.
(No Indian partner.)

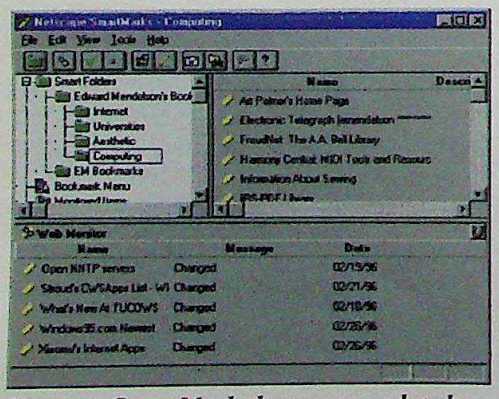
NETSCAPE COMMUNICATIONS CORP.

Netscape SmartMarks

FIRST FLOOR SOFTWARE

Smart Bookmarks

Written by First Floor Software, these virtually identical utilities check selected Web pages for changes in text, links, or both, and let you launch the altered page in your browser. Smart Bookmarks 1.0 is available from First Floor for $24.99. Netscape SmartMarks 1.0 is the licensed version available from Netscape Communications ($24.95). SmartMarks works only with Netscape Navigator; Smart Bookmarks works with Navigator as well as Microsoft Internet Explorer and Spyglass Mosaic. Both come with an extensive, well-chosen list of sites from which you can select the pages you want to monitor. You can also import your browser's bookmarks list or drag sites from your browser directly into the list of sites in the Smart Bookmarks window. When you run Netscape and either version of this utility together, the utility takes over from Netscape's native bookmarks list, and you can add a Web page to the list of monitored pages directly from Netscape's bookmarks menu. You can set the utility to be launched automatically whenever Netscape launches.



Netscape SmartMarks keeps you updated.

One of this program's cleverest features is its SmartFinder, which saves the results of a search on any of four major online search engines and then compares these results with the results of a scan at a later date. Instead of launching the search engines manually, you simply run Smart Bookmarks to see if the results have changed. In practice, you'll get many false reports of changes, because many search engines also report the number of hits of words similar to the one you want, but with some careful adjustments this feature can be highly useful. Another feature will allow authors of Web pages to incorporate an extension to HTML that will let the page send a bulletin directly to Smart Bookmarks when the utility scans the page; you can then scan the bulletin in one of the utility's windows.

PC Labs tested Version 1.0 of the utility. Until Version 2.0 of the program appears (around the time you read this), Smart Bookmarks won't let you check different pages or groups of pages at different times in the way that NetBuddy does, and you'll have to get the new version if you want the program to download changed pages for reading off-line. But in spite of a sometimes confusing interface—due for improvement in Version 2.0—Smart Bookmarks and Netscape SmartMarks have the advantages of tight integration with Netscape and a set of features and functions that, although less ambitious than those in NetBuddy, may be all you need.

Netscape SmartMarks 1.0. List price: $24.95. Netscape Communications Corp., Mountain View, CA.

(Indian partners Microland, Bangalore, and Wipro, Bangalore.)

Smart Bookmarks 1.0. List price: $24.99. First Floor Software, Mountain View, CA.

(No Indian partner.)

NetBuddy
Surfbot

Our Editors' Choice award goes to two products that automate the process of keeping you up to date on changes to your most-visited Web sites.

Internet Solutions' NetBuddy, a free, high-quality, 16-bit Windows utility, does a great job of monitoring sites. You don't even need a browser to view the pages, although a button click sends your favorite browser to the pages NetBuddy picks. You select sites to monitor by importing your browser's hot list or by clicking a button as you surf. Lists of pages to monitor, clearly laid out in a tree hierarchy, are easy to reorganize. If you want to track often-changed sites, NetBuddy gets the job done quickly, efficiently, and elegantly.

PC MAGAZINE EDITORS' CHOICE

If you need more powerful and flexible update notification, Surflogic LLC's Surfbot, Version 2.0, offers the greatest range of functions and the closest integration with Windows 95 and current browsers that we saw. If you just want to know when selected pages have changed; or if you want the latest news from an online service, Surfbot's Agents (built with its Agent wizard) can do the job. Agents let you customize rules for scanning frequency and the amount of information downloaded. Surfbot may offer too much power for the casual user, but for industrial-strength scanning it's tops.

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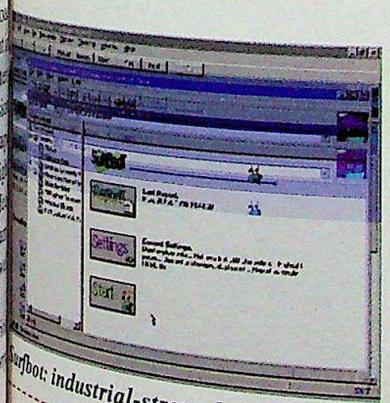
SURFLOGIC LLC

Surfbot

This elegant, full-featured, $40 utility from Surflogic LLC offers a staggering range of options for keeping up to date with changes to your favorite Web sites. You tell Surfbot 2.0 to check for changes to the sites listed in your browser bookmarks, to any individual site or group of sites that you choose, or to the lists that come with the program. The utility goes out to the Web, scans the selected pages, then displays the changed files by showing you either the first few hundred characters (you choose how many) in text mode or full HTML pages that you view in your browser. You can also tell the program to scan standard Internet search engines for changes in the result of a search.

Each list of sites to scan can have customized rules for scanning frequency and the amount of information downloaded; this combination of lists and rules is called an Agent. A wizard walks you through the otherwise complex steps for creating an Agent, and you can link an Agent to a Windows 95 Internet shortcut. When you right-click on the shortcut, the pop-up menu includes a command for reporting the text retrieved by the agent and the date of the retrieval.

Surfbot works equally well with Microsoft Internet Explorer, Netscape Navigator, or Spyglass Enhanced Mosaic, and can export lists either as HTML files or as a set of Internet shortcuts. Because Surfbot optionally loads your browser's current bookmarks when it loads, you don't have to maintain your bookmarks and Surfbot's agents separately.



Surfbot: industrial-strength scanning.

You may not want to check every item on your bookmarks for new data each time you run Surfbot, but you can prune your list of bookmarks to create a new agent that scans a subset of your bookmarks. If you're prepared to let Surfbot work for hours at a time and churn through megabytes of data, you can tell it to search all the pages linked to a scanned page in addition to the page itself.

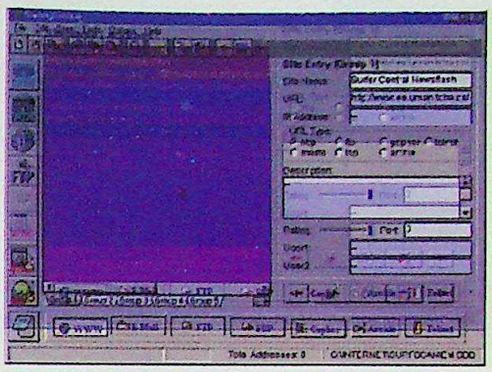
Surfbot isn't for casual use, but if you need industrial-strength Web scanning and organizing in an elegant, up-to-date interface, you won't find anything better.
Surfbot 2.0. List price: $40. Surflogic LLC, San Francisco, CA.
(No Indian partner.)

JAMES WALETZKY

Surfer Central

This $15 address book of Internet sites by James Waletzky lets you keep hundreds of Web sites, newsgroups, FTP sites, and other Internet addresses in a complex but coherent interface. Surfer Central 1.21 looks like an address book, with tabbed pages and simple lists of sites and descriptive names surrounded by a profusion of buttons and data-entry fields for more advanced functions. You can start by importing any list of browser bookmarks. Surfer Central displays them in a list box, and you select one or more to assign to a page in the address book. Address categories like World Wide Web sites and telnet addresses are displayed separately, and you can create multiple address books in separate files. For each entry, you can enter comments and a numerical rating of its interest to you, as well as other details; the program lets you choose which of its predefined fields to display. Entries can be modified while being viewed, so you don't have to switch in and out of a special editing mode as you must with other address-book programs.

You can launch an address in the current session of Netscape (though not in other applications) simply by clicking on the entry in the address book. With other applications, you drag the entry to one of the application buttons to launch the application and load the address. A pop-up menu lets you load the page currently displayed in Netscape as a new entry in the address book (though this trick won't work with other browsers). You can export address databases as ASCII files but not as HTML files that you could display in your browser.



Surfer Central is complex but coherent.

Surfer Central is sleek and efficient, but it sometimes gets confused when importing a Netscape bookmark file, in some cases failing to import an address when it imports the title that goes with that address. The program is still stuck in the Windows 3.1 era: It has a large button that launches your Winsock software, a feature no longer needed under Windows 95 or Windows NT. Its interface is inconsistent, with some features available only from a right-click menu and not from the top-line menu. But this utility still stands out among today's Internet address books for its flexibility and power.
Surfer Central 1.21. List price: $15. James Waletzky, Coquitlam, British Columbia, Canada.
(No Indian partner.)

BROOKLYN NORTH SOFTWARE WORKS INC.

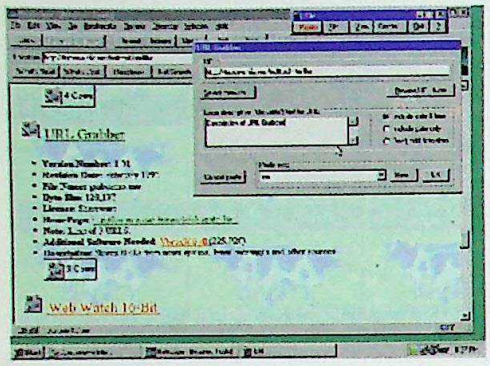
URL Grabber 95

This miniature toolbar, available for $19.95 from Brooklyn North Software Works, lets you create bare-bones HTML pages containing lists of your favorite links, with brief descriptive text that you provide. You open one of these pages in your browser and click on the link to move to the desired site.

To prepare the page, you select a URL address in a word processor, browser, or any other application and use the application's Copy command to load the address into the Windows Clipboard. You then double-click on the Paste button in URL Grabber 95, and a pop-up window lets you enter descriptive text or jump directly to the site in your browser. Other buttons on the URL Grabber toolbar let you view

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URL Grabber 95: pages of favorite links.

your saved data and create an HTML file. The program isn't smart enough to grab the URL of the page currently displayed in your browser; it's designed more to make it easy to jump to sites you haven't seen yet rather than to store sites you've already found—although it can store those too, if you select and copy the address of a site and paste it in URL Grabber.

The program can create pages of up to 32K in size—enough to include about 300 links. You can't load more than one set of URLs at a time, and the program won't let you launch more than one copy at a time. You might wish for more automation and flexibility, but URL Grabber doesn't take up much screen space, and it works efficiently if you don't mind doing much of that work by hand.

URL Grabber 95. List price: $19.95. Brooklyn North Software Works Inc., Bedford, Nova Scotia, Canada.

(No Indian partner.)

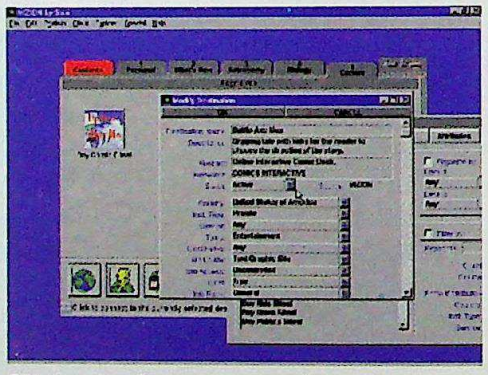
SIRSI CORP.

Vizion WebSpecial

Vizion, an elaborate Internet-site database from SIRSI Corp., is the Web organizer you need if you want to be able to see a list of sites you've previously categorized. The program comes in a free, limited version called Vizion WebSpecial 1.2 (reviewed here) and a $19.95 version called Vizion Pro. Both come with a miscellaneous selection of sites, already annotated and displayed on tabbed pages, devoted to categories covering everything from Health to Comics. To add the site currently displayed in your Web browser, click on an icon, then navigate to the confusing menu where you add your own annotations. You store the site on a tabbed page with other related pages, and identify it with one of a small gallery of clip-art icons provided with the program.

When you select the site later, the program automatically launches your Web browser, Gopher client, FTP client, or telnet client—depending on which one you specified when categorizing the site. The program's only unique feature is its ability to display a list of sites categorized according to rankings or filters you specify. Prepare to spend many hours categorizing sites if you plan to use this feature.

Among the many annoyances built into this program is a display that, should you use any screen size larger than 640 by 480, wastes massive screen space on an unused blue border around the tabbed catalog pages. If you reduce Vizion's window from the default full-screen display, you see only part of the tabbed pages—with the same blue border on two sides. You can't maneuver the tabbed pages into the center of the window, so you must expand the program to full screen to use it.



Vizion is almost too precise.

Few programs let you organize your Web sites with as much precision as Vizion. But once you've used the program for a while, you may prefer software that's less precise in its categories and more usable in its interface.

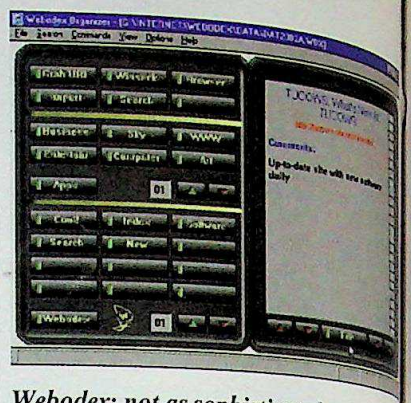
Vizion WebSpecial 1.2. List price: Free; Pro version, $19.95. SIRSI Corp., Huntsville, AL.

(No Indian partner.)

NOVAWEB INTERNET PRODUCTIONS INC.

Webodex Organizer

Novaweb Internet Productions' Webodex Organizer looks like a high-tech Rolodex, with buttons and LEDs on the left and address pages on the right. This $14.95 Internet address book turns out to be less



Webodex: not as sophisticated as it looks.

elegant than its surface, but it's still a powerful organizer. It comes with a large selection of preselected Web sites, and lets you add your own by importing bookmark files or by automatically importing the address currently displayed in your browser.

The buttons on the left pane of the interface are divided into three groups. The top group lets you grab the current URL, import bookmark files, and perform other housekeeping tasks. The middle group lists the major categories, such as Business or Entertainment, into which you've divided your addresses. The lower group of buttons displays subcategories of the main categories (like Movies and Comics under the Entertainment category). Don't even think about using these buttons without a mouse.

The right-hand address page is mid-tech. Addresses and optional comments fill each page, and tabs jump to different letters of the alphabet. You can see only one page at a time, so you must thumb through all the entries under a letter to find the one you want.

You will also not enjoy the process of adding items to the database. At each stage, you must navigate drop-down menus to select categories. If you want to create a new category, you have to cancel the data entry, create the new category, and start over. In order to edit your comments, you have to switch to a special edit mode. Webodex Organizer stores a lot of data but doesn't make it easy to modify any. □

Webodex Organizer. List price: $14... Novaweb Internet Productions Inc., Dartmouth, Nova Scotia, Canada.
(No Indian partner.)

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INTERNET SEARCH TOOLS

SO MANY MILLIONS OF MEGABYTES OUT THERE AND SO LITTLE TIME. WE REVIEW SIX SEARCH UTILITIES THAT HELP YOU SCOUR THE INTERNET FOR THE INFORMATION YOU NEED.

By Sheryl Canter

The six utilities covered here take two basic approaches to searching for information on the World Wide Web. Some of them provide huge databases of sites—typically on CD-ROM—which you surf off-line to refine your search before connecting. Others go online to query the Web's powerful search engines and build databases and indexes for you. Some of these products offer suites of utilities that do both, besides providing other functions.

COREL CORP.

Corel Internet Mania

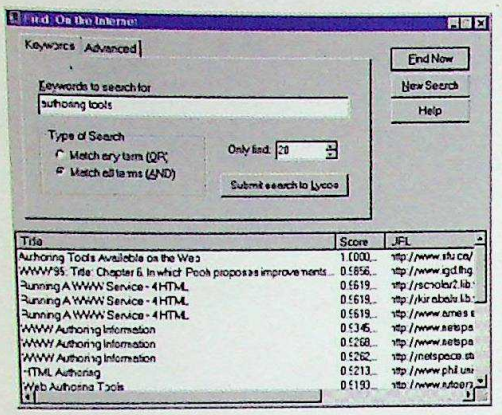
Corel Internet Mania 1.01 ($24.95) is a suite of eight Internet utilities: Lycos Web Search, Web Catalog, Web Page Update Notifier, NewsScan, QuoteScan, Home Page Author, Personal Web Server, and Corel FTP. All are 32-bit and multithreaded, and all run on Windows 95 or Windows NT. Lycos Web Search and Web Catalog offer different ways to search off-line for sites. This review will focus on those search tools.

The Lycos Web Search database—stored on CD-ROM—is a snapshot of the first half-million records of the online Lycos search facility. Under Windows 95, the program installs itself under the Start menu's Find option for easy launching. The Web Search interface is a dialog box with two tabbed pages: Keywords and Advanced. The Keywords page is where you type in keywords to search on and where you set your main search criteria. You can request that one or all of your keywords be matched by using Boolean operators (AND, OR). The Advanced page lets you select how close the match must be; there are five levels, Loose to Strong. You can also specify how many URLs to return. If you click the button labeled "Submit search to Lycos," Web Search will launch your browser and submit the search to the online version of the Lycos search engine.

To search off-line, you press the Find Now button. A list box with the search results will open beneath the tabbed pages. The headers along the top of the list box look like the header buttons in Explorer, but pressing them does not sort the output. To obtain information about a site other than its title, search score, and URL, right-click on the entry: An outline and abstract for that site, if available, will appear in a pop-up box. To go to a selected site, double-click on its entry in the list box. Web Search will launch your browser and call up the site.

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Corel Internet Mania's Lycos Web Search dialog showing search results.

Corel plans to release periodic updates, but there is no subscription service, and the off-line Lycos database will age quickly.

Web Catalog is an off-line database of Web sites organized hierarchically by topic. You move through the categories by clicking on the branches. Double-clicking on a subject node will display the sites in that category. If you see a page that contains information that interests you, you can double-click on it and Web Catalog will use your browser to display it.

Internet Mania consists of six other utilities in addition to the off-line search tools. Web Page Update Notifier lets you know when favorite Web sites have been altered and are due for another visit. Home Page Author is a limited but easy-to-use tool for creating Web pages. Personal Web Server lets you publish Web pages and downloadable files. Corel FTP is a file-transfer utility that you can use to upload your Web page to a service provider or to download files of interest from all over the Internet. Its ability to display file descriptions, when they are available, makes it especially useful. QuoteScan checks stock prices and displays 20-minute-delayed data. Its OLE automation support allows you to transfer the data directly into an Excel spreadsheet. NewsScan searches the user groups you specify for messages containing a given text string; you double-click on a message to read it. The built-in reader does not let you respond to messages, so an option is provided to use an external news reader, either for all messages or for those that have not yet expired. Unfortunately, this option did not work on our test system.

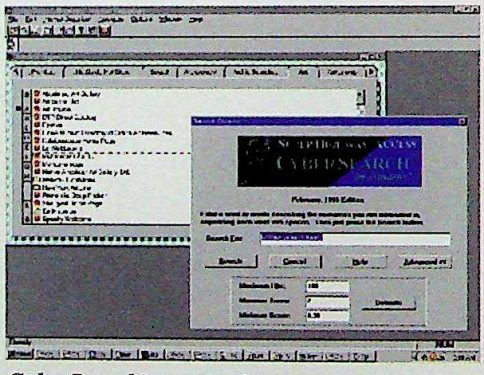
Internet Mania's off-line search facility is useful for now, but it will quickly become outdated, and there is no stated update policy. Its other utilities, however, are very useful and make Internet Mania a useful purchase.

Corel Internet Mania 1.01. List price: $24.95. Corel Corp., Ottawa, Ontario, Canada. *(Indian partners Datapro Infoworld, Pune; Svam Software, New Delhi.)*

FRONTIER TECHNOLOGIES CORP.

CyberSearch

CyberSearch ($29.95), which comes on CD-ROM, is an off-line search facility that uses a snapshot of the first half-million records in the Lycos database. The database is updated monthly, and a subscription costs $9.95 per month. The version available at the time of this writing works only with the bundled Frontier Technologies Web Browser. Version 2.0, which works with third-party



CyberSearch's two main components: a search facility and the Internet Organizer.

Web browsers, will be available by the time you read this.

Search results are displayed in a separate window. You can mark the links for viewing at a later time, retrieve them immediately, or save them to the Organizer. When you select more than one URL for retrieval, CyberSearch will offer to open them all at once automatically. Don't try this unless you have a lot of memory, because a separate window is opened for each URL. In the Version 2.0 beta, multiple instances of your browser are launched if you select more than one URL for retrieval, requiring even more memory.

The Internet Organizer has tabbed topics across the top and the letters of the alphabet down the side for quick scrolling down a long list. You can import book-marks from Netscape and Mosaic. You double-click on a URL to view its associated Web page, and a right click on an entry displays a one-line descriptive name and the URL. There is no area for comments or other information.

CyberSearch's strength is its large, online, regularly updated database. Its weakness is that the database structure for storing what you find is rather primitive.

CyberSearch (February 1996). List price: $29.95; subscription, $9.95 per month. Frontier Technologies Corp., Mequon, WI.

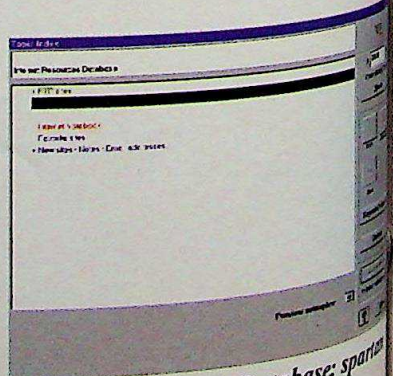
(Indian subsidiary Frontier Technologies, Pune; Indian partner Datapro Infoworld, Pune; System Aids, Bangalore;)

MARTIN BOHNET MARKET CONSULTING

Internet Resources Database

Internet Resources Database (IRD) is a special-purpose database for storing Web pages, mailing lists, newsgroups, FTP sites, and telnet sites. The Notebook feature can be used to store a list of favorite sites, the HTML source for interesting Web pages, or e-mail addresses, which you can search by keyword. The program is shareware and can be downloaded from the company's home page on the Web. Users are encouraged to add to the database files and upload new information to share with others.

IRD isn't as slick as some off-line search tools. The window isn't sized quite right when it opens, for example, and you can tell the author isn't a native English speaker—but IRD is a useful tool. The database is well designed, and the information in it is high-quality and updated constantly. Information is sorted by topic and resource type for each



Internet Resources Database: sparse but highly configurable.

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browsing. You can search by keyword, edit the database to correct errors, and add keywords and descriptions. To access a resource in an IRD database, you copy its address to the Clipboard, then paste it into your browser; the browser is not launched automatically.

IRD doesn't have a lot of bells and whistles, but it makes up for this with solid content and configurability.

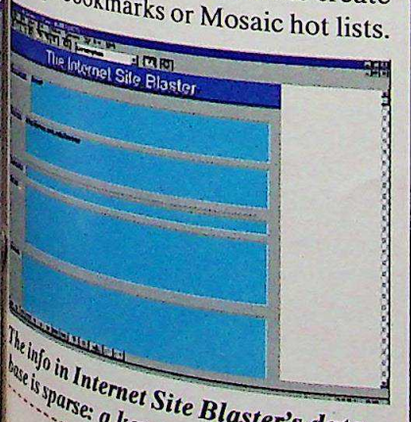
Internet Resources Database 2.0. List price: Registration and databases on-disk, $45; registration only, $22. Martin Bohnet Market Consulting, Huenstetten, Germany. *(No Indian partner.)*

SOLOTECH SOFTWARE

Internet Site Blaster

Internet Site Blaster ($43), from SoloTech Software, is a shareware database program for storing Web-site information. The registered version includes a database of 30,000 sites. The program comes with no documentation and five unnumbered disks. When you look at their contents, you'll find that the disks each contain a single .ZIP file. The installation instructions are inside the .ZIP file on the fifth disk. SoloTech might consider pulling this file out and placing it in unzipped form on the first disk. If you download Site Blaster from SoloTech's Web site, you'll get a single 1.6MB .ZIP file.

Site Blaster has a search facility, but it is nonintuitive to use. Online help, while available, is not context-sensitive. Information in the database about each site is extremely sparse—generally just a one-word description and a URL. The program will not launch your browser and take you to the site automatically, though you can use the Export function to create Netscape bookmarks or Mosaic hot lists.



The info in Internet Site Blaster's database is sparse: a keyword and a URL.

WebCompass, Version 1.0

The best off-line search tools for the Internet have extensive databases with entries organized by topic and augmented with descriptions and searchable keywords. The ability to update the database manually is also extremely useful. This lets you correct errors, enhance descriptions, and add custom keywords. It is also helpful if the tool can access online search engines, which are continuously updated. The best tools access multiple search engines at once and compile the results.

PC MAGAZINE EDITORS' CHOICE

Quarterdeck's WebCompass, our Editors' Choice, offers all these features. Its off-line databases are fairly sparse at installation, but the number of entries can easily jump to several thousand after your first online search. The hot-linked topics database is fully configurable and provides an effective structure for indexing Web resources. Online search results can also be saved to the Archive, which provides a traditional, tree-structured view of the data. Like the topics database, the Archive is fully configurable. The impressive Agent feature builds summaries of the pages found in a search. WebCompass is a powerful tool aimed at comprehensive searching, and if that's what you need, you won't find a better one.

The new version of Site Blaster has a facility for storing graphics, but we were unable to get it to work correctly. We tested the program under Windows 95 and had problems with instability and database corruption. We advise you to look elsewhere for an off-line search tool.

The best Internet search tools access multiple search engines at once and compile the results.

Internet Site Blaster 3.0. List price: $43. SoloTech Software, Madison, WI. *(No Indian partner.)*

BLUE SQUIRREL INC.

SqURL Pro

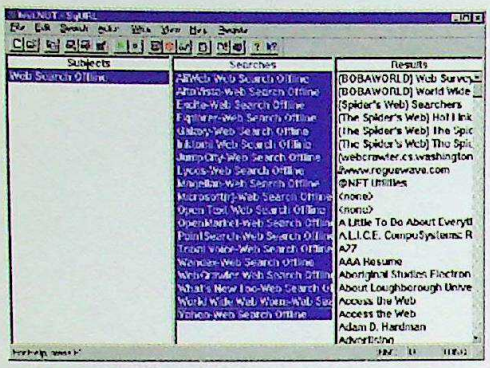
SqURL Pro ($119.95) is a suite of seven Windows 95 utilities designed to automate your Internet sessions and minimize the time you spend online. One part of the suite is SqURL (Search and Query Uniform Resource Locators), a cross-engine, online search utility that submits a search to multiple engines, sorts and dedupes the results, and saves them to a .NUT file. Although SqURL doesn't come preloaded with a searchable database of URLs, you will quickly develop these databases as you use it. Be careful not to reuse a database name, however. SqURL will allow it and then crash.

Each .NUT file contains one or more search Subjects, which in turn contain Keyword Searches for each search engine used. Each Keyword Search has an associated set of Results. SqURL displays these three categories of information in a three-paned window. Information about the Searches and Results (Web sites) can be obtained by right-clicking on an item and selecting Properties. Web-site information is limited to title, URL, the search engine that found the site, and some details about when it was found. There is no field for descriptions, and you can not add new search engines.

SqURL Pro is more than just a search facility, and its other components are very useful. Grab-a-Dial lets you use Dial-up Networking in an automated scheduling program, something you can't ordinarily do under Windows 95. The companion utility, Don't Stop, lets the Dial-up Networking session run unattended by clicking the Connect button for you. Once connected, you can use SqURL to search the Web, Grab-a-Site to capture part of

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SqURL Pro's three-pane search interface with Subjects, Searches, and Results.

the Web to your hard disk, and SendMail to activate Exchange with a script-enabling command line. Hang-It-Up hangs up the phone for you when you're done, and it's handy for automated scripts and for starting a download and going off to the movies.

SqURL Pro won't help you organize your bookmarks, but it can help you locate resources on the Web, and it comes with a suite of useful utilities.

SqURL Pro. List price: $119.95. Blue Squirrel Inc., Salt Lake City, UT.

(No Indian partner.)

QUARTERDECK CORP.

WebCompass

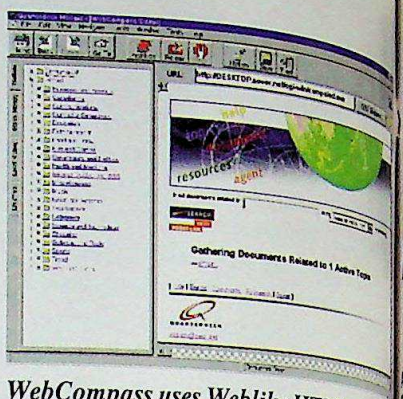
WebCompass 1.0, from Quarterdeck Corp., lets you search both online and offline. Priced at $139, it is by far the most powerful search tool in this roundup. In addition to a search-and-retrieval engine, the product includes three other components: the Quarterdeck Mosaic browser, Quarterdeck WebServer, and the local Web pages that make up the search engine interface. URLs are stored in Mosaic's Archive database, which uses a tree structure similar to Explorer's. WebCompass also works with third-party browsers.

The Archive display can be toggled on or off with a button press, and it consists of four tabbed pages: Hotlists, Global History, Local History, and Link Tree. The Hotlists are an editable set of URLs organized by topic. Over 500 URLs come preloaded in a hot list. You can add to the list or create a new one. You can import URLs from Netscape, NCSA Mosaic, or HTML files. The Global History page lists all the sites you've visited. The number of days before a link expires and the number of links saved can be set in the Preferences dialog box. The Local History page shows you where you've been during the current session. The Link Tree organizes the Local History hierarchically, so you can see at a glance how the links are related to each other. To view a URL on any of the four pages, simply click its icon.

The central feature of WebCompass is its enhanced search-and-retrieval engine. WebCompass can search multiple online databases, then organize and summarize the information it finds. This is time-consuming, but it can be done in the background while you perform other tasks. You can speed things up by selecting only relevant search engines, or *resources*. Resources are grouped by type (General or Media, for example), and the types are configurable. You can also add new search engines. When a search is done, you can save the results to the Archive.

WebCompass is a complex program, but it rewards you with extraordinarily powerful tools for retrieving, organizing, and storing information.

The search engine interface, WebCompass Editor, is written as a set of HTML documents and CGI scripts. It requires Quarterdeck WebServer to run. The simplest way to search is to type in keywords, select the resources to use, and click Search. This will return a list of documents with any duplicates already removed.



WebCompass uses Weblike HTML documents as interfaces to its search engine.

The easiest way to perform a search is to start by looking in the topics database for the subject of interest. Each topic record includes the topic name, topic type (for example, thing or person), definition, query terms, and search resources to use. The query terms include alternative spellings and synonyms, and ensure the broadest search possible. You can edit the information in a topic record, and you can add new records. When you find the topic you want, click on Activate Inactive Topic and return to the WebCompass Editor. You'll see the topic in the Active Topic list.

To begin a background search of the Internet resources you've selected, you click Start Agent. The Agent will compile a list of the sites it finds, automatically create summaries, and link the information to the topic database. As you work with WebCompass, the topic database becomes filled with associated Web sites. We encountered some stability problems when doing background searches of the Web. The system would sometimes freeze and crash after switching to another program. There were also some redraw problems in the WebCompass Editor.

WebCompass is a complex program and you'll have to spend some time to get comfortable with it. But once you do, you'll be rewarded with an extraordinarily powerful tool for retrieving, organizing, and storing information from the Web. The more you use it, the more completely you'll be able to command the subjects that interest you. □

WebCompass 1.0. List price: $139. Quarterdeck Corp., Marina Del Rey, CA. *(Indian partner Unison Computers, Bombay.)*

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INTERNET PLUG-INS AND HELPERS



We pick the top 30 helper apps and Netscape Navigator plug-ins. *By David Lidsky, Thomas Mace, Michael W. Muchmore, and Eyal Rabinovitch*

Audio

Cool Edit 95
Syntrillium Software Corp., Phoenix, AZ.
http://www.syntrillium.com
Cool Edit 95 is a powerful sound editor, with professional-level features, that you can set up as your browser's audio player. Its capabilities may be overkill for simply listening in the sounds of the Web, but if you're interested in graphically manipulating sound in a large number of audio formats, it's a wonderful tool. You can try out most of its features for free, but shareware registration is required for permanent use.
Price: Shareware registration, $50.

Internet Wave 1.0
VocalTec Inc., Northvale, NJ.
http://www.vocaltec.com
The free Internet Wave 1.0 audio player is a well-designed helper application for accessing Internet Wave audio, one of the Web's handful of streaming-audio formats. The other Internet Wave components—an audio encoder and a server component—are also free, making this a great way to experiment with audio on your site. The Internet Wave codec, derived from the company's Internet Phone product, is well suited to delivering music over a low-bandwidth connection. Internet Wave is available for Windows 3.1, Windows 95, and Windows NT.
Price: Free.

MidiGate 6.1.4
PRS Corp., Hong Kong.
http://www.prs.net/midigate.html
MidiGate 6.1.4, a 16-bit Windows application, is an ingenious helper application that lets your browser play MIDI files accessed through links on Web pages. This unobtrusive player will let you start, stop, change position the file pointer on the fly, loop your selection, and save or play a local copy of the MIDI file. The PRS site boasts a huge archive of classical-music MIDI files. MidiGate requires VBRUN300.DLL, which you can download from the site.
Price: Shareware registration, $10.

RealAudio 2.0b2a
Progressive Networks Inc., Seattle, WA.
http://www.realaudio.com
Currently the Web's best-known audio format, RealAudio is a sophisticated and powerful streaming-audio technology that can deliver sound to hundreds of users simultaneously over Internet connections as slow as 14.4 Kbps. The RealAudio encoder and server are heavy-duty and expensive, but the elegant player, a Netscape Navigator plug-in, is available free from the company's Web site. You'll find tons of RealAudio entertainment on the Web, from live news to 50-year-old radio broadcasts of "Superman." The RealAudio player is available for Mac OS, Unix, Windows 3.1*x*, and Windows 95 (and is Windows NT–compatible).
Price: Free.

ToolVox Web Player
Voxware Inc., Skillman, NJ.
http://www.voxware.com
ToolVox for the Web is a speech-oriented audio technology that can stream clear sound across the Internet through incredibly low-bandwidth connections—as slow as 2,400 bps. The Web player, a Netscape plug-in, offers a slick trick we've seen nowhere else: the ability to speed up and slow down the rate of playback. The Web player is available for Mac OS, Windows 3.11, and Windows 95.
Price: Free.

TrueSpeech Player
The DSP Group Inc., Santa Clara, CA.
http://www.dspg.com/
The DSP Group's TrueSpeech Internet offers a zero-cost path to putting high-quality streaming audio on your Web site. TrueSpeech Player is a free download, and the encoder is built into the Windows 95 Sound Recorder. The TrueSpeech Player is available for Mac, PowerMac, Windows 3.1*x*, Windows 95, and Windows NT.
Price: Free.

Graphics

Acrobat Reader 2.1
Adobe Systems Inc., Mountain View, CA.
http://www.adobe.com/Acrobat
As a helper application to your Web browser, Acrobat Reader lets you view Portable Document Format (PDF) files posted on the World Wide Web. You need to download the documents before viewing. Acrobat Reader preserves the integrity of typefaces and graphics in a document and ensures that the formatting will not be altered during printing. PDF files feature cross-platform compatibility, so Acrobat Reader will work across many systems. A number of plug-ins are available for Acrobat Reader, including one to play QuickTime or AVI movies.
Price: Free.

Acrobat Amber Reader
Adobe Systems Inc., Mountain View, CA.
http://www.adobe.com/Amber
Acrobat Amber Reader is a Netscape Navigator 2.0 plug-in that allows users to view and navigate PDF files directly in their browsers. Amber Reader is a beta version of what will be released in the middle of this year as an update to the Acrobat product line.
Price: Free.

Astound Web Player 1.0
Gold Disk Inc., Santa Clara, CA.
http://www.golddisk.com/
Gold Disk's Astound Web Player (AWP) is a utility that lets you view multimedia content created in Astound and Studio M presentations directly in your Netscape Navigator window. If you have another browser, AWP loads as an external viewer. Clicking on a project hyperlink downloads the presentation gradually, before your eyes. First, the background appears, followed by graphics, sound, animation, and any video. AWP also supports interactive command buttons.
Price: Free.

Envoy Plug-In for Netscape Navigator 2.0
Tumbleweed Software Corp., Redwood City, CA.
http://www.twcorp.com/
Envoy Plug-In for Netscape Navigator lets you view Envoy documents directly within your browser, eliminating the need for a separate Envoy viewer. Envoy is an electronic publishing format that delivers document portability in a cross-platform environment while maintaining a consistent look. Envoy boasts smaller files and less memory use than Acrobat documents. Envoy documents include a navigation toolbar and support right-mouse-button functionality.
Price: Free.

Fractal Viewer
Iterated Systems Inc., Atlanta, GA.
http://www.iterated.com
Fractal Viewer lets you view and manipulate Fractal Image Format (FIF) files, a compressed format that eats less bandwidth than other image types. Fractal Viewer downloads an image progressively: First you see a thumbnail, which gradually grows to a full-screen, full-resolution image. Image manipulation features can be accessed through right-mouse menus, and you can do everything from altering color to flipping and rotating. Iterated Systems makes Fractal Viewer available as a plug-in for Netscape Navigator 2.0 and as a helper application for other browsers.
Price: Free.

NCompass OLE Control Plug-In 2.0
NCompass Labs Inc., Vancouver, British Columbia, Canada.
http://www.excite.sfu.ca/NCompass/
The NCompass plug-in allows OLE controls to work inside Netscape Navigator 2.0 and Internet Explorer 2.0. Developers can embed OLE controls in standard HTML pages, and the controls execute in the browser when the page is retrieved. OLE controls provide an interesting method of putting interactive multimedia on your Web page, one that should become more prevalent this year. The Excite Center home page offers some intriguing demos including a multiplayer game and 3-D graphics. NCompass is available only for Windows 95.
Price: Free.

Shockwave for Director
Macromedia Inc., San Francisco, CA.
http://www.macromedia.com/Tools/Shockwave
Macromedia Director has long been known as a premier multimedia authoring tool, and Shockwave for Director, a Netscape Navigator plug-in, now lets developers put Macromedia Director content directly into their Web pages. When you access a Shockwave page, the Director content—sound, video, animation, and interactive features—executes right inside the page. Some of the Web's most exciting multimedia content is based on Shockwave, so don't miss the wave.
Price: Free.

Video

CoolFusion 1.4b
Iterated Systems Inc., Atlanta, GA.
http://www.iterated.com
Iterated Systems complements its Fractal Viewer with CoolFusion, a Netscape plug-in, which lets you explore audio, video, and animation on the Web. CoolFusion lets you view a file as it is being downloaded, for a near-streaming effect. CoolFusion does not give you the choice of downloading the clip directly, and high-quality viewing means keeping the image small. Still, CoolFusion is a very promising product in the race for real-time, low-bandwidth multimedia on the Web.
Price: Free.

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The Ultimate Utility Guide

MediaSauce 1.1
FlatCracker Software, Lindon, UT.
http://www.flatcracker.com
The shareware version of FlatCracker's MediaSauce is a multimedia viewer that not only supports audio (MIDI and .WAV) and video (.AVI and .MOV) files but will even control your CD-ROM drive. The viewer, which is available for Windows 3.1 and Windows 95, is somewhat slow to initialize, especially when playing video, and it lacks support for MPEG playback. But if you can live with its overly hip kinetic interface, you'll find that its strong control functionality and high-quality audio and video playback make it an excellent choice for multimedia viewing.
Price: Registration, $19.95.

NetToob 2.03b
Duplexx Software Inc., Salem, MA.
http://www.duplexx.com
NetToob is a multimedia player whose ability to play many of the standard digital video formats on the Web (MPEG, QuickTime for Windows, and Video for Windows) is a plus for the Web surfer who wants an all-in-one viewer. Although it's missing some perks like a slider bar for moving through the file and a resizable screen, NetToob's audio and video quality are a match for those of many viewers that handle a only single format. NetToob features a screen-saver element that will play a downloaded video when your computer is idle, and Duplexx Software promises an upgrade, NetPipe, to support streaming MPEG-1 audio and video over the Net.
Price: Registration, $14.95.

PreVu
InterVu Software, Rancho Santa Fe, CA.
http://www.intervu.com
PreVu is a Netscape plug-in MPEG player, which unlike other video plug-ins lets you look at the first frame before you commit to a full download. If you decide to go ahead, you can either download and play the file for viewing with any MPEG player or else view the download as it happens, for a near-streaming effect. PreVu, currently in beta, is free for downloading; InterVu Software has announced plans for incorporating audio in the near future.
Price: Free.

QuickTime for Windows 2.1.1
Apple Computer Inc., Cupertino, CA.
http://quicktime.apple.com
QuickTime for Windows, the video component of Apple Computer's QuickTime multimedia products for the Web, delivers clear sound and high-quality, resizable images. You can't preview your video clip or view it during downloading, but QuickTime does give you an easy-to-use control interface with volume, rewind, and fast-forward controls and a slider bar to restart the file at any point.
Price: Free.

StreamWorks
Xing Technology Corp., Arroyo Grande, CA.
http://www.xingtech.com
StreamWorks is one of the new products currently offering true streaming video across the Internet. What makes StreamWorks unique is its ability to provide real-time encoding and transmitting across the Web to StreamWorks clients. The free StreamWorks player typically delivers a very slow frame-rate over anything slower than ISDN, but the picture quality remains high. It can function independently of your browser and lets you surf the Web for active StreamWorks video sources. The same player can be used to hear StreamWorks streaming-audio sources.
Price: Free.

VDOLive
VDOnet Corp., Palo Alto, CA.
http://www.vdolive.com
VDOLive, like StreamWorks, provides true streaming video and audio for the Internet. You'll need ISDN or better for this to be more than an interesting technology demo, however. The free player, which can act as a Netscape 2.0 plug-in or a helper, looks sharp, but it's missing a slider bar for repositioning the pointer. The encoder is built to support as many as 100 simultaneous streams.
Price: Free.

VMPEG Lite
Stefan Eckart.
ftp://papa.indstate.edu/winsockl/Windows95/Graphics/vmpeg17.exe
VMPEG Lite is a basic, easy-to-use viewing tool that supports only MPEG video files. Although it is missing a slider bar and other user controls, its video playback quality is among the best we've seen. VMPEG Lite offers both video and audio, something which other MPEG-only players often lack. Playback is snappy, and you can freely size the viewing screen without risking loss of video quality.
Price: Free.

Virtual Reality

CyberGate 1.0 Beta 1
Black Sun Interactive, San Francisco, CA.
http://www.blacksun.com/
This VRML browser can be used either as a standalone viewer or as a Netscape plug-in. It spawns the external viewer when a .WRL link is accessed. Black Sun worlds are enhanced for interaction with other users by avatars, chatting, threaded conversations, and cards that describe users. Point-and-drag or keyboard navigation is facilitated by constraints that don't let you go through walls or beneath floors. CyberGate supports sound effects, nested WWWInline nodes, and background images. The installation file is a hefty 3.8MB; CyberGate is available for Windows 95 and Windows NT.
Price: Free.

CyberPassage Beta 2
Sony Corp., Japan.
http://sonypic.com/VS-E/vstop.html
CyberPassage adds moving objects, sound, and 3-D animation to the VRML 1.0 model. A Netscape helper app, CyberPassage's well-designed interface sports a navigation toolbar, a scouter, a jumping eye, and bookmarks. The download file weighs in at 3.3MB, and the browser requires a reasonably fast PC running Windows 95.
Price: Free.

Fountain Beta 5
Caligari Corp., Mountain View, CA.
http://www.caligari.com
Fountain is both a browser and a rapid modeler of 3-D worlds. Configurable as a Navigator helper app, it doesn't offer strong navigation features, but its authoring capabilities shine. You can easily grab an object from a world and put it in your own. To comfortably navigate through worlds with more than a couple of thousand polygons, you should have a Pentium PC, 16MB of RAM, a video card with 3DR hardware acceleration, and a 28.8-Kbps or faster connection to the Internet. The download file is 3.2MB. Fountain works under Windows 3.1 or Windows 95.
Price: Free.

Netscape Live3D
Netscape Communications Corp., Mountain View, CA.
http://www.netscape.com
Netscape Live3D is a VRML plug-in from the premier Web browser vendor. Live3D offers distributed, interactive 3-D spaces with text, images, animation, sound, music, and video. It extends Netscape's Java, JavaScript, and plug-in interfaces to make it easy to develop distributed 3-D applications. Live3D is based on the proposed Moving Worlds VRML 2.0 specification.
Price: Free.

QuickTime VR Player
Apple Computer Inc., Cupertino, CA.
http://qtvr.quicktime.apple.com/
QuickTime VR Player is a standalone application that lets you navigate QuickTime VR virtual worlds. These are intriguing panoramic environments, typically created from digitized photographic images. QuickTime VR worlds appear in the player window, but you can explore them through 360 degrees using arrow keys or a mouse. QuickTime VR Player, available for the Mac, Windows 3.1, and Windows 95, is an extension to the QuickTime video player, which you specify as a helper app in your Web browser.
Price: Free.

VRealm
Integrated Data Systems Inc., Savannah, GA.
http://www.ids-net.com
A plug-in for Netscape 2.0 or a standa... application, VRealm displays in the ... browser's window. Integrated Data ... tems claims full VRML 1.0 compati... and high dependability, color ... mance, and speed. VRealm offers ... modes of movement (walk, fly, ... model), dual-mouse control, jump to ... headlight feature, and the ability to ... between linked worlds without exiting ... program. The company recommends ... least a Pentium 90 with 16MB of R... the download file is 2.5MB.
Price: Free.

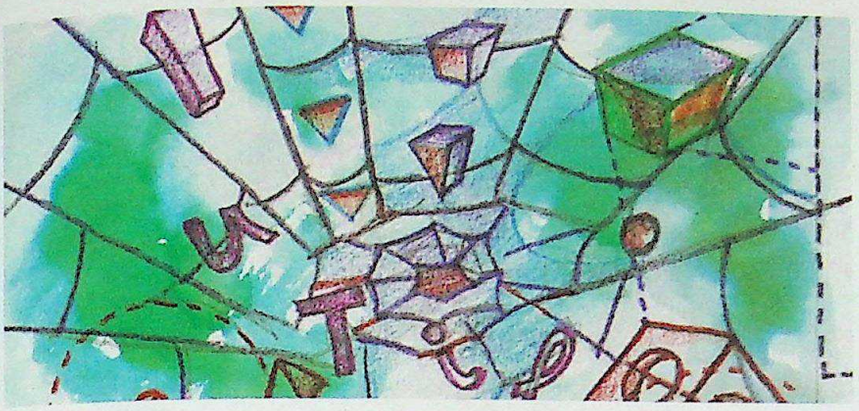
VRML Add-In 2.0 for Internet Explo...
Microsoft Corp., Redmond, WA.
http://www.microsoft.com
This VRML plug-in for Microsoft Inter... Explorer 2.0 displays VRML content ... side a browser window. Navigation ... snappy, featuring Walk, Slide, Tilt, ... Spin buttons to modify joystick, ke... board, or mouse operation, and there ... Walk Through Walls menu toggle. VR... Add-In supports ASCIIText nod... ShapeHints, improved lighting, ba... ground download, texture mapping, ... lision detection, object manipulat... and dynamic clipping-plane adjustme... A 1.9MB download, VRML Add-In ... quires Windows 95, Microsoft Inter... Explorer 2.0, and a fast PC.
Price: Free.

WIRL
VREAM Inc., Chicago, IL.
http://www.vream.com
WIRL is a high-power, extended-VR... plug-in for Netscape that displays rig... the browser window. Buttons for mov... rotating, and positioning camera view... sist mouse-drag navigation. WIRL s... ports realistic texture mapping, and... tions, and multiple light sour... VREAMScript extensions let you ... things like launch a phone dialer or pl... sound by clicking the mouse on the ... propriate object. WIRL runs on Wind... 95 and Windows NT, and the down... file is 3.1MB. A commercial version ... available for $29, including upgrades ... a year.
Price: Free.

WorldView 0.9G
Intervista Software Inc., San Francisco...
http://www.intervista.com
WorldView is a standalone VR... 1.0–compliant browser with extens... for perspective, collision detection, ... ping-plane adjustment, GZIP compr... sion, background colors, stanc... HTTP access, and messaging. Using ... WorldView will start Netscape ... HTML link is accessed. The down... file is 1.7MB. We found the pre-beta ... sion to be quite unstable, so don't be ... prised if you experience runtime er... WorldView is available as a Win... 3.1 Win32s application, or for Win... 95 and Windows NT.
Price: Free.

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MORE INTERNET UTILITIES

FROM FILE-TRANSFER PROGRAMS TO CYBER CENSORS, WE TEST A GRAB BAG OF PRACTICAL INTERNET TOOLS. MOST ARE AVAILABLE STRAIGHT FROM THE WEB.

By Padraic Boyle, Jay Munro, Rick Rovegno, and Larry Seltzer

The Internet has produced more than its share of useful and powerful utilities. We look at four of the most important categories. FTP clients let you log onto a remote FTP server to transfer or manage files. Screening and filter utilities give parents a tool for keeping their children from accessing Internet content they find objectionable. Time keepers and monitors provide a handy way of tracking the connect time you're paying for. Finally, uuencoders decipher the binary-to-text encoding techniques used to transfer binary data through text-only vehicles like e-mail.

For the commercial products reviewed here, we indicate the usual pricing and contact information. For shareware and freeware, contact information is often incomplete or unavailable. In those cases, we have supplied at least the author's name and a known download site at press time. The reviews that follow, based on hands-on testing, will get you up to speed on what these utilities are built to do and which ones offer the best results.

FTP CLIENTS

BY JAY MUNRO

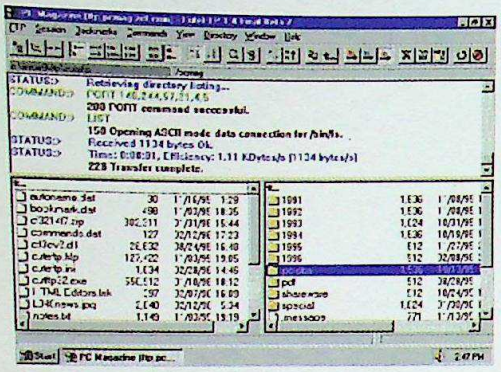
File Transfer Protocol (FTP) utilities are built for transferring files between local clients and remote FTP servers, and for remotely managing files and directories for those servers. You can use them for everything from casual downloads to serious Web-site maintenance. The difference between utilities meant for casual use and those designed for professionals lies in the details of the available customization options and file management convenience features.

CuteFTP, Version 1.4, a $30 shareware utility available in 16-bit and 32-bit Windows versions, is the most comprehensive of the packages reviewed here. Niceties like the ability to filter files on both local and remote directories, and convenience features like group select, deselect, and invert selection, make it an ideal tool for serious site maintenance. It comes preloaded with 36 connection profiles arranged in a folder hierarchy. You can add your own profiles through a single screen where you specify host name, user ID, password, port, delay, retry, and firewall information, as well as log-on type (normal or anonymous), transfer type, and a multiline comment.

Online, you work with side-by-side local and remote directories. To transfer files, you can drag and drop, double-click, or use the Download or Upload buttons. CuteFTP's one drawback is support,

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CuteFTP's file management niceties make it a natural for site management.

which is currently available only through e-mail. (Alex Kunadze.)
(No Indian partner.)

Designed to handle most standard FTP tasks, **FTP Icon Connection 2.2** ($25) is an attractive Windows 95 shareware application that shows great promise but was not fully stable in testing.

If you're comfortable with Explorer windows in Windows 95, you'll feel at home with FTP Icon Connection's interface. The package comes with ten preloaded FTP connections, which are displayed as large icons in the program's main window. You can add your own connections using a simple Connection Wizard where you enter the host name, user ID, password, initial host, and local directories.

The package displays remote files and directories as icons or folders. When you're inside a directory, you can use right-mouse menus to open or close a connection, delete a file, create a folder, and upload or download a file. You can also examine properties like the name, date, or size of a file, directory rights, and owner and group rights to a file.

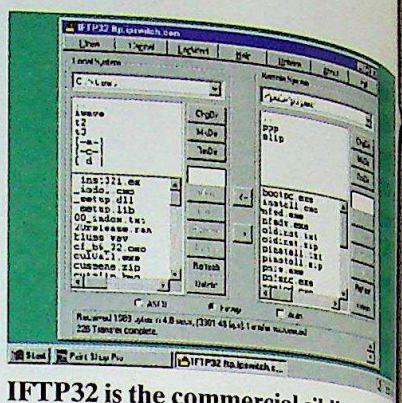
Unlike most FTP utilities, FTP Icon Connection lacks a second window, so you can't see local and remote directories simultaneously, but you can drag and drop files between its main window and the Windows 95 Explorer. (J-Technology Inc., Athens, AL.)
(No Indian partner)

Integrated Internet FTP, Version 1.1.0 (IIFTP), is a $25 FTP utility that's easy to set up and use, and it provides most of the features you'll need. IIFTP's screen layout puts the local directory on top and the remote directory on the bottom with a two-line status display in between. At the bottom of each directory view are buttons to execute all the basic FTP commands. It does not support drag-and-drop.

You can set up connections quickly with the Profile configuration screen where you enter your filename, host name, user ID and password, local and remote directories, and firewall information. A useful IP smart caching feature lets you store the IP number for a site, cutting DNS overhead when you make the connection.

Integrated Internet FTP also comes with a personal FTP server intended for local file transfers. The IIFTP client and server both support PASV connections, where the client rather than the server is forced to open the data connections, obviating some firewall connection problems. (Kent D. Behrens, Waco, TX. or Aquila Internet Services Inc., Aurora, IL.)
(No Indian partner.)

Elementrix Technologies' **POTP Secure FTP 1.52** is a $198 FTP bundle that includes both a Windows 3.1 client and a local FTP server. Its most unusual feature is its ability to perform encrypted transfers.



IFTP32 is the commercial sibling of the elegant (and free) WS_FTP32.

The Secure FTP client looks and fe like the Windows 3.1 File Manager, w menu selections added for network a security features. Buttons are provided copy, move, rename and delete files a directories, as well as to encode, deco connect, and disconnect. You can upl and download through drag-and-dr

Saved connection profiles include FTP host name, user, password, and lo

PRODUCT REVIEWS

Product reviews in
PC Magazine India
enable decision-makers
in the corporate sector
ranging from CEOs to EDP
executives to select the products
that meet their specific requirements.

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and remote directories. You can change the port setting and pick among a comprehensive list of connection protocols including Chameleon, generic DOS/Windows, Secure FTP, Unix, and Windows NT. To use the secure features, you must be connecting to a Secure FTP server. For corporate applications, a Unix version of the server is available for $2,500. (Elementrix Technologies Inc., New York, NY.)

(No Indian parner.)

WS_FTP32 proves that some of the best things in life are still free. This popular and elegant freeware package for Windows 95 and Windows NT covers most needs. Commercial sites must license Ipswitch's $45 IFTP 32, a commercial sibling.(Ipswitch Inc., Lexington, MA.

WS_FTP32's interface shows local and remote directories side by side. To transfer files, you double-click on a file or press the appropriate arrow buttons when the file is highlighted. WS_FTP32 supports all the standard file commands, plus PASV.

WS_FTP32 comes with 23 preset FTP sites, and you can easily add more through the nonintimidating Session Profile screen. If you are new to FTP, the first screen gives you all the information you need including name, host, user ID, password, and account ID if needed. The second screen lets more advanced users edit the port, the retry, time-out, and initialization commands, and firewall information. (John A. Junod, Martinez, GA.)

SCREENING AND FILTERING UTILITIES

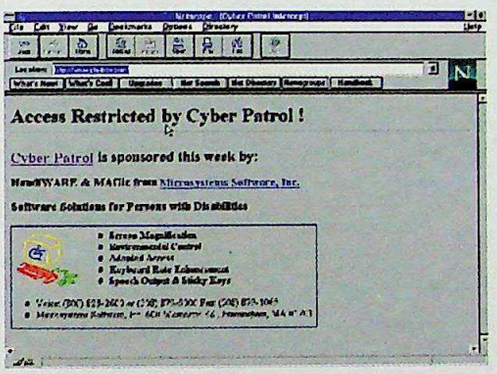
By Padraic Boyle

Net filters give parents the tools to shield children from the adult-oriented subject matter that proliferates on the wild side of the Internet. Because the Internet is growing so quickly, it's difficult for Internet filtering products to keep up. Net filters don't promise to block 100 percent of the objectionable materials out there, but they do provide admirable coverage. We review six Net filtering programs in this roundup.

Microsystems Software's **Cyber Patrol** ($49.95 list price, including six months of CyberNOT updates) provides an excellent solution for parents wishing to police their children's Internet use. Cyber Patrol created its CyberNOT Block List screening database by heeding the baser interests of the average 12-year-old. The CyberNOT Block List is broken up into categories, giving parents the flexibility to enforce restrictions based on their own values. Parents can also deny access to sites not included in the CyberNOT Block List. You can download and test-drive a free Home Edition, which expires after a seven-day trial. (Microsystems Software Inc., Framingham, MA.)

(No Indian partner.)

Solid Oak Software's **Cybersitter** ($39.95 list; filter-list updates, free) relies on a filtering list made up of terms, phrases, Web and FTP sites, and newsgroups to block undesirable material. Cybersitter blocks words or phrases by the context in which they appear, not just by the word or phrase alone. Words and phrases can be removed from the page without restricting access to the whole page.



Cyber Patrol knows when you've been naughty and displays this message.

When an unauthorized user attempts to access a restricted site, Cybersitter can be configured to block, block and report, or just report the violation to a database that only the parent can access via password. A trial version of Cybersitter can be downloaded from Solid Oak's Web page. (Solid Oak Software Inc., Santa Barbara, CA.)

(No Indian partner.)

InterGO ($49.95 direct), from InterGO Communications, excels in the integration of Internet and other tools into an easy-to-use interface for limiting access to certain Internet sites. InterGO includes a Web browser, search engine, e-mail, FTP, telnet, news reader, spell-checker, and virus scanner.



InterGO integrates KinderGuard and other Internet tools right on your desktop.

KinderGuard, InterGO's screening module, uses a default database of well-known objectionable sites, blocking access based on the site's age-group rating and the user's ID. Parents can enter specific sites or newsgroups to add to KinderGuard's database. They can also create separate log-on IDs with different access ratings for individual users. KinderGuard's ratings classification by age group, however, does not allow for site-by-site approval or restriction for each user. KinderGuard does not offer any reporting capabilities, nor can you filter out words or phrases. InterGO is currently available only in a Windows 95 version. (InterGO Communications Inc., Plano, TX.)

(No Indian partner.)

NewView's iscreen! (one year, $39.95 direct) proactively rates the content of sites on their levels of sex, violence, and 11 other criteria to create its SafeSites. The SafeSites concept allows access only to Web pages that have been rated by NewView. NewView projects that over 1 million sites will be rated within the year, and you can add unreviewed Web sites to your approved access list locally.

Parents create user profiles using a log-on ID to personalize access for each of their children. The profiles are compared with the SafeSites database to check each child's access level. If someone attempts to disable iscreen!, the parent is notified, and access to the Internet is denied. A copy of iscreen! is available from NewView's Web page. (NewView Inc., Redwood City, CA.)

(No Indian parnter.)

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Net Nanny, from Trove Investment Corp. ($49.95 list; dictionary updates, free), features a unique search engine that monitors, screens, and blocks data as it is being accessed by any application running on your computer. Net Nanny's install and setup are DOS-based, however, and easily accessible to any knowledgeable user, including your computer-savvy child. Net Nanny's next version, due out by the time you read this, will feature Windows-based installation and setup.

To monitor applications, Net Nanny uses a dictionary of user-definable words and phrases deemed inappropriate, and it keeps track of words or phrases in violation. Net Nanny creates an audit trail to allow parents to see the number of violations and the offending words or phrases used. In addition to blocking inappropriate data from being accessed from your computer, Net Nanny's dictionary blocks information such as credit card numbers from leaving your computer. (Trove Investment Corp., Vancouver, British Columbia, Canada.)

(No Indian partner.)

SurfWatch ($49.95 direct; monthly updates, $5.95), from SurfWatch Software, provides the power to block access to material on Web and FTP sites, Gopher, and chat lines, but it lacks many features essential to comprehensive monitoring.

SurfWatch comes with more than 2 thousand sites in its blocking database. But parents cannot customize the database, and SurfWatch does not offer individual IDs for different household users. To access a site that is being blocked, you must disable SurfWatch, and there are no monitoring or reporting capabilities available for parents. (SurfWatch Software Inc., Los Altos, CA.)

(No Indian partner.)

TIME KEEPERS AND MONITORS

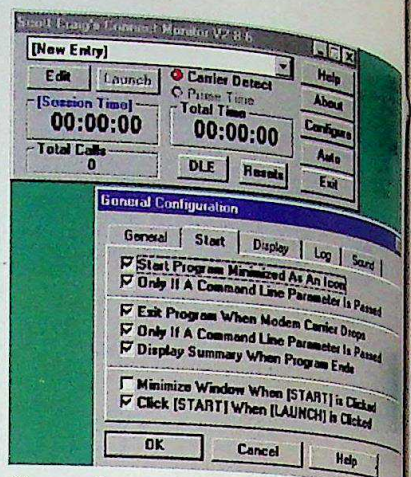
BY JAY MUNRO AND RICK ROVEGNO

Time is money, and that's what time keepers and monitors are all about. These utilities help you keep track of your expensive online connection time. They can be triggered by your modem's carrier detect (CD) signal, or by manual or programmatic control. The main differences among the utilities reviewed here lie in their launching methods, logging capabilities, alarm features, and ability to perform cost calculations.

Communication Connect Time Monitor 2.8.6 (CCTM) is an attractive freeware package by Scott Craig that's loaded with features. Monitoring can be triggered automatically from the COM port or manually by a Start/Stop icon (script-based startup is not available). Once CCTM is active, an icon shows you either the total number of calls made when you're off-line or the elapsed or session time when you're connected. You can configure alarms for total-time, prime-time, daily-time, or session-time limits; you have the option to attach a .WAV file to the warning as well. The package works with both dial-up and LAN connections.

You have a choice of per-session, daily, monthly, or user-definable logging options. Neat perks include the Download Estimator, which gives you an idea of how much a download will cost, and the Carrier Delay, where you can enter a delay to compensate for the time taken between carrier detect and actual log-on. CCTM's automated setup and its clear, concise documentation will have you up and running quickly. (Scott Craig, Nashville, TN.)

(No Indian partner.)

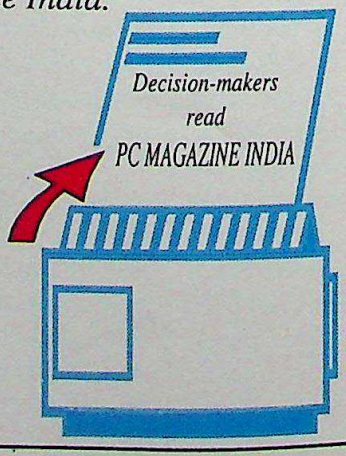


Communication Connect Time Monitor watches connect time so you don't have to do it.

You may be a scientist, academician, doctor, engineer, chartered accountant, or a corporate management executive.

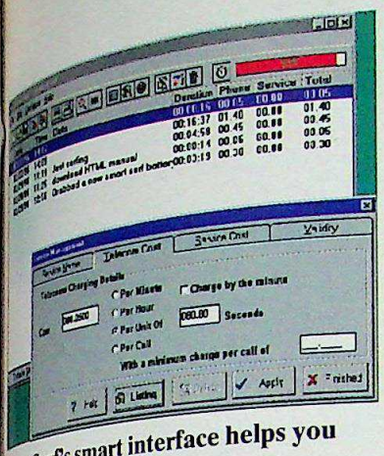
You may be a student of computer science, a fashion designer interested in exotic shapes and colors, a successful individual using applications to enhance your productivity, or a complete novice.

In short, whatever your area of specialization or work, if success and profit matter to you, read about the latest developments in the world of PCs in *PC Magazine India.*



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SmartSurf's smart interface helps you monitor online charges.

Log Tick 3.1, a $25 shareware package by Ton Martens, displays as an icon while you're online, but rather than tracking time, it shows accruing costs. Given Log Tick's context-sensitive help, its cost calculation methods were easy to access and understand. We found Log Tick initially difficult to install; once configured though, it worked fine. You can configure it to start manually, from a Carrier Detect signal, or with a script. It also lets you calculate costs for multiple Internet service providers. Log Tick's tracking and logging abilities were good, but it was somewhat too easy to reset and lose information accidentally. The registered version of the package lets you configure alarms to play your favorite .WAV files. (Ton Martens, AC Heemskerk, The Netherlands.)

Net Clock 4.6, a $15.50 shareware utility by David W. Yutzy, is a flexible timer system that is easy to set up and use. You can choose to launch it manually, automatically by carrier detect, or through Winsock activity. Installation is simple—just unzip the distribution file into a directory—and the online help is clear and accurate. A status screen displays the method of billing, cost, and time. When minimized, it displays time and cost. On the downside, the product requires Winsock to be accessible when set up, and it lacks a configurable alarm. (David W. Yutzy.)

Online Time Tracking Program 1.0, by Richard D. Pollett, is somewhat limited compared with many of the other products reviewed here, but it has the benefit of being freeware. It lets you track a wide variety of information on a single screen and provides an icon for minimized viewing. But it has limited logging capabilities and lacks both online cost calculation and configurable alarms for specific events. You can configure Online Time Tracking Program to launch multiple services from a row of icons, available when the program is maximized. Online Time Tracking Program offers the choice of launching manually, via script commands, or automatically with carrier detect. Overall we found the program difficult to set up and use. (Richard D. Pollett.)

SLIP db 1.01 is a $22 shareware timer utility by Derrick R. Webber that is designed to be launched through external log-on scripts. The product gives general guidelines for script writing, but it offers no examples for major online services. It cannot launch a session manually or via carrier detect. To use SLIP db with Windows 95 requires the scripting tool from Microsoft Plus! The package offers limited built-in cost calculations. Information from the log file can be copied to the Clipboard in tab-delimited form for pasting in a spreadsheet or word processor. SLIP db does not have alarm capabilities. (Webber Technical Services, Ottawa, Ontario, Canada.)

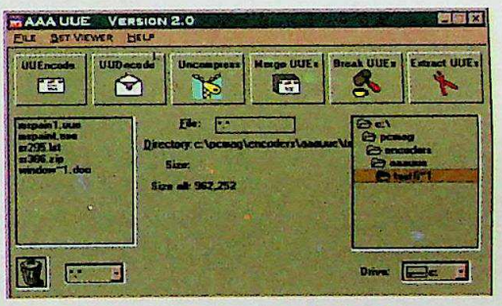
SmartSurf 1.20 is an attractive freeware program, complete with icon bar, tool tips, and a Microsoft Office–like toolbar mode. Sessions are triggered by the modem's carrier detect, or you can launch them manually. SmartSurf cannot be started from a script. At the end of each session, a dialog box pops up, so you can enter a comment. Log records can be added, deleted, or edited on the fly. SmartSurf allows extensive configuration, with tabbed dialog screens for service, application (covering browser, e-mail, and FTP clients), and modem information. A downside is that you are forced into a rather strict input format on the configuration screens (you must enter 000.100 for 10 cents, for example). Log files can be exported either by copying them to the Clipboard or via a comma-delimited file (.CSV) that can be imported into a spreadsheet or database. Although the product is freeware, it requires periodic "recharging" every 90 days, which you accomplish by logging onto the SmartCode site and downloading a new "battery." The online help is comprehensive. (Oakley Data Services, Sandback, Cheshire, U.K.)

UUENCODERS

BY LARRY SELTZER

Uuencoding (Unix-to-Unix encoding) is a method for converting binary data, such as programs or images, into text data that can be transmitted by such text-based systems as e-mail. At the receiving end, the text string is decoded into its original binary format.

You run into uuencoding a lot on the Internet. It is most commonly used for sending binary data in Usenet messages, and it is the most widely used method for transmitting binary attachments to e-mail messages. If you have ever received an e-mail with garbled text lines, each beginning with an *M*, at the bottom of the message, you probably got a uuencoded attachment that your



First in the alphabet, AAA UUE performs basic tasks well.

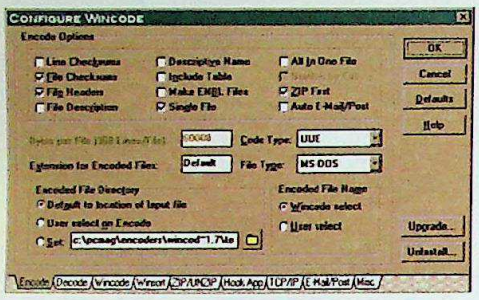
software didn't translate or your e-mail program didn't know how to decode.

Uuencoding is so prevalent on the Internet because most of the communication on the Internet is 7-bit (the result of a long legacy of finding least common denominators in the course of its development), and uuencoding is the most common way to transfer 8-bit data—most executable files—over the Net. Uuencoding is a method of translating the 8-bit data from the executable file into the 7-bit character range that character-based programs support.

A number of different uuencoding formats are out there, and the programs reviewed here all support a variety of them. We discovered that there are multiple formats for splitting files as well.

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Wincode offers the richest interface and best features of the three uuencoders we tested.

A new standard called MIME (Multipurpose Internet Mail Extensions) is gaining popularity, but ironically, MIME increases the need for uuencode/uudecode utilities. If you use a MIME-only mail system and someone in the outside world sends you a uuencoded attachment, you'll need one of these utilities to put it into a usable format. None of the programs reviewed have official download sites, but they are widely available. At the end of each review, we list a download site valid at press time. Using one of the Web's many search engines, such as Lycos, Webcrawler, or Yahoo, will turn up many more.

AAA UUE 2.0 was obviously named to get in the front of reviews and sorted FTP listings. It's free for download, but the author requests a $5 contribution. It has some nice features, although its interface lacks polish. AAA UUE does the encoding and decoding with small external DOS programs, so you get DOS sessions popping up when you use it. AAA UUE makes it pretty easy to break uuencoded files into smaller components and merge them back together.

AAA UUE also has a facility for calling PKZIP to handle .ZIP files, but there are much better Windows alternatives, in case that's an important feature for you. The program does not accept command line parameters, so it won't work with Windows 95's SendTo feature. The help system supporting AAA UUE is also somewhat meager. But AAA UUE did uuencode and uudecode properly for us, and it's worth the modest sum the author requests. (Scandere Software USA, Dennisport.)

UUCode 3.1.4 is the simplest of the programs tested, but it still offers strong functionality. The registration fee is $10, and an additional $6 gets you the printed manual and the latest version on-disk. Among the programs we tested, only UUCode can both encode and decode MIME. It can join but not split multipart uuencoded files. We couldn't get UUCode to work with some of our test split files, however. There is more than one uuencode format, and one that is supported by UUCode is Wincode. Version 3.1.5, the latest version, just missed our review but it should soon be available on AOL, CompuServe, and Internet forums. (Sabasoft Inc., Naperville, IL.)

Wincode 2.7 doesn't have every feature you might want in an encoder/decoder, but it has the richest user interface, and it offers the most appealing set of features of the products reviewed here. Though all of the products were tolerably good at encoding and decoding, Wincode encodes to MIME and decodes uuencoded data on the Clipboard as well. It is available for free download, and a help file is available for a $10 registration charge.

The program provides lots of automation capability, and it can hook into other Windows applications. It can send encoded/decoded files via SMTP mail or NNTP to Usenet. Wincode lets you decode a group of split uuencoded files, but you cannot split them at the encoding phase. Wincode's facility for calling PKUNZIP after uudecoding also worked well, and Wincode works well with Windows 95's Send To function. You can send it uuencoded files; it will decode them and then quit.

Wincode also has a facility for hooking into the menus of external programs. We found that it worked on 16-bit but not on 32-bit Windows programs, which is not surprising since Wincode itself is written in 16-bit Windows code.

Wincode's author makes his money by selling the help file. Given that some of the program configuration is complicated and that Wincode generally works well, you may want to buy the help file. (Snappy_Inc., Albany, NY.) □

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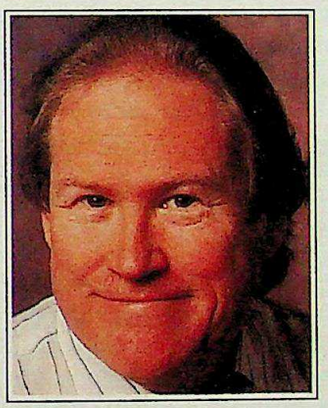
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JOHN C. DVORAK

Apple's Big Mistake

Apple Computer has reached a critical stage. The future of the company will probably be decided in the coming months. Over the years, the Macintosh has evolved into a niche machine. The Mac still owns 70 to 80 percent of the prepress and graphic-arts markets, but its share of the overall market is dropping to the single digits. And its share of the schools market, which the Mac has traditionally dominated, is being eroded.

Unlike most computer users, I've always used both platforms. Over the years, I've also tried to remain objective when comparing the two platforms. What has been difficult to understand is how the Mac, which enjoyed a decade-long head start over other graphical user interfaces, has somehow fallen into a niche. Simple explanations such as price and lack of clones begin to explain the situation, but in my opinion they don't tell the whole story.



MAC-CENTRIC

Microsoft has copied from the Mac, while Apple has paid little attention to Windows.

I recently received a simple comment from a reader that made me realize the Mac will have a difficult time recovering market share from the PC, especially after Intel rolls over the market with its MMX version of the Pentium. The reader stated that over the last ten years Microsoft has copied or cloned idea after idea from the Mac. Meanwhile, the reader argued, Apple has paid little or no attention to developments in the PC community, let alone bothered to clone any of the notions developed by Microsoft.

There are plenty of cute ideas in both Windows 95 and OS/2 that would be appreciated by Mac owners. When the Mac came out in 1984, it had a groovy look and feel. When Windows first came out, it looked terrible. Years later, with Version 3.0, Microsoft wised up and used the artist who was responsible for much of the Mac interface. With Windows 95, Microsoft really upped the ante. Meanwhile, the Mac looks much the same as it did in 1984.

This stubbornness is reflected in Mac users, whom I thought had mellowed over the years until I perused some Mac forums and discovered the same arrogant attitude that predominated in 1984. This group causes more problems for the Mac by failing to find anything positive about the PC and Windows. It's as if this holier-than-thou contingent of Mac users has resurfaced in a last-ditch effort to rescue the platform from obscurity.

There is never any open debate from these Mac users, just ridicule. Every point and counterpoint is peppered with derisive terms such as "Windoze," "File Mangler," and "PeeCees." But on the flip side, you never hear PC users referring to the Macintosh as "Muck" or "Muckintosh." Or in place of PowerMac, the "Powerless Mac." Instead, PC users just roll their eyes and go back to work.

This whole lame situation reminds me of what happened to the Amiga. With a true multitasking GUI operating system, genuine stereo digital sound, and honest-to-gosh NTSC video, the machine remains amazing to this day. But its users as a group were mostly jerks. We'd get letters here at *PC Magazine* claiming that we didn't write about the Amiga, that what we said was wrong, or that we didn't get down and worship the machine properly. The only difference between Amiga users and Mac users is that the Mac users had a successful computer, so they just became arrogant. Now that the Mac is perceived as failing, at least in the short term, its users are turning into clones of the Amiga crew.

This addiction to a particular platform has hurt both the Amiga and the Mac. It threatens to do the same to OS/2. Microsoft, for some odd reason, seems to work from an underdog stance despite its dominant position. The company assumes that better things may be out there and, when it finds them, it incorporates the technology into Microsoft products, such as operating systems or word processors.

This concept is not unknown to Apple, though the company seems to have forgotten it. When Apple first developed the Mac OS, it was largely a derivative of Xerox's Star. Apple borrowed plenty of ideas from Xerox to make the Mac OS what it is today. Xerox took no cues from Apple, and Star is now a part of computer history. Later, when Microsoft developed Windows, it was largely a derivative of the Mac OS. Apple has taken no ideas from Microsoft and. . . . I think you can see where I'm headed with this. We really need alternative platforms, because competition benefits users. Let's hope Apple gets back on track before it's too late. It can start by taking a hard look at Windows 95.

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GEMINI: Unix System for the Enterprise

The integration of OpenServer and UnixWare will lead to unparalleled scalability.

When SCO acquired UnixWare from Novell, its sole aim was to extend the company's reach in the international Unix operating systems' market to the large networked enterprise. As a matter of policy, the company decided to retain its own OpenServer and the newly acquired UnixWare as two distinct products meant for different market segments. OpenServer is based on Unix System V Release 3, and is ideal for small- to medium-sized companies. UnixWare is based on Unix System V Release 4, and caters to the extremely demanding requirements of large enterprises. The policy decision was prompted purely by business considerations. Two products mean more revenue.

UnixWare 2.1, the new version of the OS shipped after SCO acquired UnixWare technology from Novell, is an open endorsement of the company's dedication to the enterprise level of operation. OpenServer continues to be marketed as an ideal solution for small and medium-sized companies. It has a number of plus points, including tight integration with Microsoft Windows and an abundance of compatible applications.

Of more interest to readers, however, will be SCO's ambitious plans to integrate features of OpenServer and UnixWare into a composite Unix implementation system called Gemini, which will serve as a universal operating system for original equipment manufacturers (OEMs) and independent software vendors (ISVs) to create products on. Gemini will be interoperable with NetWare, MS Windows, and other popular computing environments.

Scheduled to hit the market sometime in 1997, Gemini is not an end in itself. It is an integral part of a new generation Unix technology strategy developed jointly by SCO and Hewlett-Packard Company. The technology is based on a three-dimensional architecture (3DA). Products based on 3DA will be modular in structure, and will support processor and system optimization. Modular structuring will enable customization at the individual module level. Interoperability will be guaranteed through standard inter-module interfaces. Processor optimization will mean that the OS will exploit specific processor architectures without compromising on application or cross-platform interoperability. Finally, system optimization features will enable system builders to modify OS modules for optimal performance under different system topologies.

Gemini will have functionality clusters to support advanced system management features like self-configuration, auto-detection, self-healing and correction, remote administration, asset management, and so on. Software management features will include electronic distribution and protection against viruses. Crucial NetWare services will be supported through Universal Network Support. Open Software Foundation's Distributed Computing Environment (OSF DCE) will also be supported. The OS will permit interoperability with Microsoft networking and SunSoft's (a subsidiary of Sun Microsystems) Open Network Computing (ONC) services.

Gemini's Internet services will depend entirely on SCO's Internet strategy and Atlas, an SCO project launched in February 1996 to exploit OpenServer and UnixWare technologies for business on the Internet.

Other mentionable features of Gemini will be comprehensive security including support for the International Cryptography Framework (ICF); common management, software distribution, and object support for Windows and Unix users sharing networks; and application, data, and hardware compatibility with existing HP-UX, SCO UnixWare, and SCO OpenServer systems.

To make migration from OpenServer and UnixWare to Gemini smooth and hassle-free, SCO will release source and binary code to OEMs. This will enable them to overcome compatibility problems between UnixWare 2.1 and the Single Unix Specification (SPEC 1170). The decision will help OEMs create standards-compliant products based on UnixWare technology.

SCO is also planning to ship Comet, the latest version of OpenServer, which can be expected to offer new features and better integration with UnixWare.

Towards the end of 1996, SCO will commence the distribution of the Gemini Software Development Kit (SDF) for the creation of single binaries for both OpenServer and UnixWare. Besides having a reliable Unix system development environment, the kit will contain libraries and tools for the creation of applications that will run smoothly on Gemini, UnixWare and OpenServer. It will also contain an advanced hardware development kit for the creation of hardware drivers for Gemini, and for upgrading UnixWare drivers.

All said and done, much will depend on the attitude of vendors towards the new evolution process. According to current indications, Gemini has the potential of evoking widespread support in the Unix market, provided certain constraints are removed to the satisfaction of all. The period of wait-and-watch is nearly over. The list of technological specifications that needs to be attended to is daunting. Commitment alone, even if it comes from prestigious organizations like HP and SCO, is not enough. Commitment must be backed by concrete action. Both HP and SCO have started the process of collecting and collating crucial information from interested partners. This process is bound to be long and protracted, considering that effective communication channels must be set up between hardware and software vendors that have some direct or indirect association with HP or SCO. It will take time to gather all the requisite information and to organize it into meaningful data for incorporation in the evolutionary process. A lot will also depend on SCO's and HP's attitude to problem areas that require more concise elucidation. For instance, there is a visible dearth of information on migration from existing systems to Gemini and beyond. What about interoperability of applications while migrating from one environment to the next? SCO and HP have already announced plans of delivering advanced Unix technologies for the Pentium, Pentium Pro, and PA-RISC processors in 1997. Support for Intel's P7 architecture will be released later. NEC has announced plans for a MIPS port of Gemini.

—Hirendra Chaure

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MARKET

Mac OS Licensed to IBM

To further its commitment of making the benefits of the Apple Macintosh platform available to a broader number of customers, Apple has announced that it has licensed the Mac OS to International Business Machines Corporation (IBM). The IBM agreement, in addition to a licensing agreement with Motorola announced last February, is aimed, through open licensing, at expanding the Macintosh platform market by offering customers additional sources and wider choices for Mac OS-based systems.

The broad licensing agreement allows IBM to sub-license the Mac OS to any systems manufacturer building systems with IBM PowerPC microprocessors. As a result, IBM and its sub-licensees will now be able to develop and ship the Mac OS with a wide variety of hardware systems, based on the current Power Macintosh architecture, or on the PowerPC platform specification (CIIRP). This agreement further solidifies the Mac OS as an open platform which will be supported by a variety of component and system vendors. Although IBM will be able to sub-license the Mac OS without requiring licensees to sign an agreement with Apple, Apple will certify all systems sold with the Mac OS to ensure compatibility.

"IBM has long been a strategic Apple partner, and has the global, technical and marketing strength to propel the Macintosh platform to a new, expanded role, said Lamar Potts, vice president of OS and technology licensing, Apple Computer. This much-anticipated agreement instantly opens up business opportunities for computer manufacturers worldwide."

"The Mac OS is renowned for its ease of use and consumer appeal," said Michael J. Attardo, general manager (microelectronics division), IBM, "With IBM's worldwide reach and our relationships with systems manufacturers, we're committed to proliferating the Mac OS and building upon the success of the PowerPC platform. Apple has been our valued partner in defining the PowerPC chip and PowerPC platform, and today we join forces to enable the industry for Mac OS."

IBM intends to sign sub-licensing agreements for the Mac OS with Datatech Enterprises (DTK) and Tatung, both manufacturers of a range of computer equipment. The licensing agreement includes versions 7.5.X of the Mac OS, access to the next major release of the Mac OS, and access to the 16 local language versions of the Mac OS that Apple has so far approved for licensing.

Autodesk Launches Mechanical Desktop

US-based Autodesk has launched the Autodesk Mechanical Desktop, a tightly integrated software application that provides advanced 2D and 3D mechanical design functions on desktop systems. The new software, in combination with programs developed by more than a dozen industry-leading partners in the most important mechanical market segments, provides complete design-through-manufacturing solutions for Autodesk customers. A few of the Indian companies that have already made commitments to the Autodesk Mechanical Desktop include L&T, CPTools, Hawkins, Godrej, Escorts, IFB, and Minda Industries.

The Mechanical Desktop contains integrated modules for parametric solid and surface modeling, assembly modeling, and associative drafting, as well as AutoCAD Release 13 and the Autodesk IGES translator. Autodesk's award-winning Mechanical Library will be included in the US version. The Mechanical Desktop provides the most significant functions requested by designers of machines, electromechanical assemblies, common moulded parts, and other mechanical products.

The Mechanical Desktop is much quicker and far less limiting than several of the more expensive design products. The Autodesk Mechanical Desktop has a multi-platform license which includes MS-DOS, Windows NT, Windows 3.1, and Windows 95. It will also be available for Windows NT on Digital Equipment Corporations's Alpha system.

The Mechanical Desktop is compatible with other Autodesk offerings, including Autodesk WorkCenter, for technical document and workflow management, and AutoVision Release 2, for advanced visualization and rendering. The Mechanical Desktop can be installed from a single CD. All modules share a common interface with completely integrated menus. Autodesk operates in India through its wholly-owned subsidiary in Bangalore.

Novell Launches Software Development Center

Novell, the world's leading network software provider, has opened a software development center in Bangalore. Called India Development Center (IDC), Novell's software center is an exact replica of the existing Novell engineering centers in the US, in terms of software development and testing facilities, and technical and managerial skills. This was disclosed by Lenley Hensarling, vice president (engineering), Novell, USA, when he formally opened the IDC set up at a cost of Rs 150 million. Novell Software Development (India) has been established as a subsidiary of Novell, USA, for developing and exporting software products.



Hensarling (second from left) and Vikram Shah (third from right) at the IDC launch.

Hensarling said, "Novell IDC will develop quality software products and technologies by leveraging Indian software talent."

Novell has partnerships with other technology and market leaders to help users make networks a part of their everyday lives. The company's NetWare Operating System enjoys a 65% market share internationally, with over 50 million modes. In India, the product commands more than 90% of the market share.

"Novell IDC has a team of more than 100 experienced software professionals and plans to double its strength by the end of the year," says Vikram Shah, director of Novell IDC.

IDC is a member of Novell's Corporate Quality Council and has adopted Novell's open management culture that nurtures team work and creativity. Novell IDC has exported software worth Rs 92.3 million with net foreign exchange inflow of Rs 87 million. Novell IDC plans to more than double its software exports during the next 12 months.

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Intel's Program for the Indian IT Industry

US-based Intel Corporation, the market leader in microprocessor chips, has announced an ambitious program for the Indian IT industry. The program aims at increasing general technology awareness and computer literacy, and to help Indian IT companies develop solutions for the Indian home and business computer market.

As an integral part of the program, Intel launched a computer education institute for the general public at the National Science Center in New Delhi, in conjunction with the National Council of Science Museums. Dr Craig Barrett, executive vice president and chief operative officer, Intel Corporation, who inaugurated Cyberskool, an Intel-funded multimedia lab for school children, said, "We hope to give India's school children and families a taste of how technology can, and will, enhance their lives. By providing hands-on access to people, they get a first hand look at how powerful a tool a computer can be for their learning at home as well for their productivity at work."



Dr Craig Barret (in grey suit) launching Cyberskool.

Cyberskool has several Pentium-based PCs equipped with popular CD titles. The learning center will also offer Internet access.

Atul Vijayakar, country manager, Intel India, added, "Intel has been one of the leaders in the creation of the information age, and providing access to the information and learning opportunities is consistent with both Intel's and the National Science Center's core values."

Intel is planning another fun-and-learning facility at the Nehru Science Center in Bombay. More such centers will come up at popular science museums in the metropolitan cities of the country.

For university students, Intel has set up a lab at the Indian Institute of Technology (IIT), Bombay. The lab is equipped with Pentium-based workstations and servers networked with ProShare desktop video conferencing. A similar lab is being set up at IIT, Delhi. The aim of these labs is to provide state-of-the-art technology to the academic community and to promote R&D activities on Intel-based architecture. The labs will also be used as a resource to supplement classroom instruction.

Intel is also working with NIIT and Aptech, two of India's leading computer training institutes, to provide training material, assistance, and technical support to their students.

The Intel Technology Center in Bangalore will provide technology ingredients and products for developing solutions based on Intel architecture.

Cisco Acquires StrataCom

US-based Cisco Systems, a leading supplier of networking equipment and software, has decided to acquire StrataCom, an ATM and frame relay WAN switching equipment supplier. The acquisition is estimated to cost about US $ 4 billion. It will enable Cisco to provide a broader end-to-end networking solution across public, private, and hybrid networks. The two will combine their expertise in ATM and LAN switching to evolve more pervasive networking solutions supporting integration, and scalable multiservice features for public carriers, Internet service providers, and enterprises.

Under the terms of the acquisition agreement, shares of Cisco common stock will be exchanged for all outstanding shares and options of StrataCom. Each StrataCom share will be exchanged for one Cisco share. The agreement also provides for the inclusion of Dick Moley, president and CEO of StrataCom, on the Cisco board of directors.

Says John Chambers, president and CEO, Cisco Systems, "By combining our networking technologies with those of StrataCom, Cisco will become the first vendor to provide advanced network infrastructure for the intranet and Internet environments, and the only vendor to offer end-to-end connectivity across public, private, and hybrid networks."

The two companies have also entered into licensing and OEM agreements under standard terms. StrataCom will license Cisco IOS software for integration into its line of WAN switching products and Cisco will distribute and resell StrataCom's entire product line worldwide.

StrataCom develops, delivers, and supports FastPacket networking systems for ATM applications in private WANs and public carrier service offerings such as frame relay, ATM, and the Internet.

Cisco Systems operates in India through its liaison office in Delhi. Its distributors include Wipro Infotech, Microland, UB Networks, Datacraft (I) Ltd, Tata Unisys, and Apcom Computers.

Symmetrix Corporation Starts Operations

Symmetrix Corporation, a new company specializing in technology solutions for the distribution industry, has commenced operations in Bangalore. Formed by Prahlad Suresh, former MD, Manhattan Associates, Symmetrix will offer consulting and project management to manufacturers on product bar-coding, carton marking, and other means of product identification and tracking. It will also market off-the-shelf solutions for printing bar-codes.

"In order to take advantage of world-class solutions that are now available in India, manufacturers need to standardize product identification procedures to organize their distribution function," says Prahlad Suresh. As a result, there is an increasing demand for organizations providing total solutions in setting up distribution operations.

Symmetrix has business partnerships with industry leaders like Tata-IBM to provide full support from conception through implementation of the distribution and warehouse functions. Symmetrix also has an array of packaged solutions used worldwide by reputed companies to meet their warehousing and distribution needs. Symmetrix has tied up with Manhattan Associates to market its Pick Task Management System package in India which runs on the IBM AS/400 platform.

Symmetrix also has expertise in implementing the radio frequency method of data collection to enable real-time updating of information in warehousing and inventory control applications. Symmetrix is formalizing relationships with vendors of scanning and printing equipment.

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TIE-UPS

DEC & CyberCash in Strategic Tie-Up

Digital Equipment Corporation and CyberCash, a leading developer of secure Internet payment solutions, have announced plans to incorporate CyberCash technology in Digital's Internet products. Digital intends to offer the CyberCash CashRegister Merchant solution and CyberCash Wallet as part of Alpha Internet commerce solutions, to enable secure electronic commerce on the Internet.

"Combining CyberCash's expertise in electronic payments with Digital's high performance Alpha platform provides a perfect solution for businesses interested in Internet commerce, and we are excited to work with Digital," said Magdalena Yesil, co-founder and VP (marketing and technology industries), CyberCash.

"Digital is partnering with the premier application leader in electronic commerce such as CyberCash, to deliver a range of commerce solutions," said Rose Ann Giordano, VP of Digital's Internet business group. "Digital's Alpha system offers businesses a scalable solution that optimizes application performance as the company grows."

The technology provided by CyberCash and Digital is intended to offer customers a complete and real-time merchant system for secure, high-volume transactions over the Internet. Digital intends to offer the CyberCash Wallet and CashRegister with Digital Alpha Internet server solutions to enable full-scale electronic commerce over the Internet.

CyberCash Wallet gives consumers the instantaneous ability to pay for goods or services received from merchants on the World Wide Web, and provides secure communication between the consumer, the CyberCash merchant, and the bank. CyberCash Wallet is a free software program that is installed on a consumer's PC. It allows CyberCash transactions to move between a merchant's server and the bank transaction server system. CyberCash Wallet has the graphical look and feel of a real wallet and supports any number of credit cards including Visa, MasterCard, Discover, and American Express.

CyberCash CashRegister, a secure merchant payment service, provides software integration modules into a server platform which accepts payments made with CyberCash Wallet over the Internet, and receives the information necessary to process a credit card, electronic check, or coin transaction. The CyberCash system is designed to build on, and be compatible with, existing financial institution infrastructures, and allows CyberCash merchants to process transactions with US credit card processors.

Seacom to Reproduce Data Nova POS Solutions

Seacom Solutions India, a Pune-based IT company, has set up a joint venture with Data Nova of Norway to market Point of Sale (POS) solutions. Data Nova will hold a stake of 60% in the new venture, and the balance will be held by Seacom. The company will be managed independently by Seacom Solutions, whereas all solution technologies will be provided by the Norwegian principal.

Data Nova, a leader in the field of POS, has over 1,700 installations in Scandinavia and the UK. The backbone product of their POS solution, Transaktor, will be available to Seacom at the source code level. This will enable the Indian partners to customize the solution for various niche markets. Since Transaktor will be reproduced at Seacom, it will be one of the most cost effective POS solutions available.

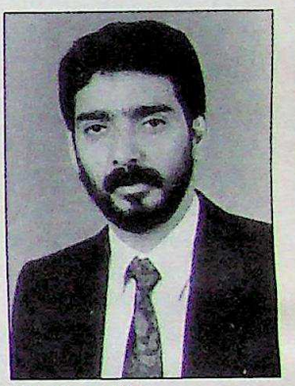
Since Transaktor can be used in DOS, Novell, Windows, and Unix environments, it will provide a very flexible solution for not only single unit stores, but also for store chains even in multiple cities. Seacom is working out options to bundle various financial accounting packages and database modules with Transaktor to make it a comprehensive and integrated solution. Transaktor will also provide connectivity to all POS peripherals such as bar-code printing, bar code scanning, DTP, weighing scales, credit verification, electronic fund transfer, and catalogue shopping.

Transaktor will be offered to the Indian market both in software packaging as well as in bundled solution form. Strategically, the company is looking at small stores and single terminal users as the biggest market. After the initial successful launch in the Pune and Bombay markets, plans are being made to distribute the product through a national distribution channel, mainly through solution providers.

Discussions are on with some of the leading software distribution houses to take on the distribution through their channels. Since the company has the source code technology, complete product support and time-to-time upgradation will be provided to all the Transaktor users.

MicroUniv Is Netscape's Main Education Partner

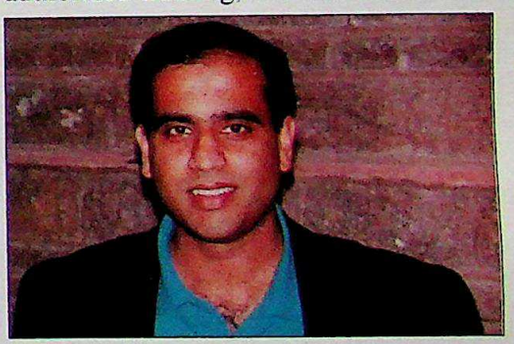
US-based Netscape Communications Corporation has appointed MicroUniv, the training division of Microland, as its principal education partner in India. Microland of Bangalore is a leading Indian enterprise networking company.



Pradeep Kar.

Says Atri Chatterjee, director (server marketing), Netscape, "We are very pleased to have Microland as our principal education partner in India. This relationship will help develop the skill sets required by our customers and partners to effectively leverage our leading-edge technology."

Pradip Kar, CMD, Microland, adds, "The Internet is fast becoming omnipresent as a medium. By providing Netscape authorized training, we will enable customers to build skills with Netscape products, to rapidly deploy Netscape products that support their business and increase their productivity." MicroUniv will offer training on client/server applications from Netscape for the full server line of products. The courses will be conducted by Netscape-certified instructors.



Atri Chatterjee.

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Compaq on BPL Consumer Goods Channel

Compaq Computer Corporation has announced a strategic alliance with BPL to market the Compaq Presario range of home computers in India. This is the first time in India that a computer manufacturer and a consumer durable company have come together to make available computer products.

BPL currently has 150 exclusive showrooms all over the country. The network will expand to over 250 outlets by the year end. Compaq Presario computers will initially be made available through 40 such outlets covering 16 of the largest cities across the country. Later, these will be sold through all the 150 BPL outlets.

According to Abhishek Mukherjee, country manager, India, Compaq Computers, "There is a tremendous amount of synergy in this tie-up. With Compaq's worldwide leadership position in PCs, and BPL's pre-eminent position in the Indian entertainment electronics area, this partnership will usher in a new era in computer marketing in this country. This vast BPL retail network will enable consumers to buy our computers more easily and in the same way that they would buy any other consumer durable product."

Commenting on the tie-up, L.H. Bhatia, sales director, BPL, said, "We are of the belief that computers, communication and entertainment electronics are coming together. Computers were the missing link in our product portfolio. We decided to go ahead with Compaq because they are the world leaders in PCs and we believe that BPL, as a successful company, should tie up with another successful company."

"To carry out the pioneering work of creating a market for home computers in India, we believe both partners must be financially strong. We are putting in place a separate Home Computer Strategic Business Unit to manage this new area," he further added.

BPL will finance Presario computers through their "Home A Loan" scheme which is managed by the Countrywide Consumer Finance Company. BPL is also planning to tap the 500,000 strong BPL consumer database to access potential Presario users.

The BPL group of companies is present in six main areas of business including entertainment electronics, home appliances, instrumentation (testing and measuring), office automation, medical electronics, and telecom and power components. The group turnover for the fiscal year 1995-96 is estimated at Rs 22.82 billion.

Compaq Computer Corporation is the world's largest supplier of personal computers, offering desktop PCs, servers and options. The company reported worldwide sales of $ 14.8 billion in 1994-95. Compaq products are sold and supported in more than 100 countries through over 38,000 Compaq marketing partners. Compaq established a presence in India in 1992.

HCL Ties Up with James Martin

Noida-based HCL Corporation, a leading IT group with interests in computers, networking, software services, computer education, office automation, and medical diagnostic imaging, has created a joint veture with James Martin & Company of the US, to provide quality systems redevelopment and Year 2000 solutions. Called HCL James Martin, the joint venture will be located in Virginia, USA, and will provide a complete strategy and methodolgy to manage the quality of existing enterprise-wide systems, and upgrading them to future architectures based on individual needs. While HCL will have 60% stake in the joint venture, the remaining 40% will be controlled by James Martin & Company.

Says Ashok Jain, CEO, HCL James Martin, "We will partner our clients worldwide for a smooth transition into the Year 2000 and redevelop legacy information systems on their existing information technology assets." Michael D. Devito, president, HCL James Martin, adds, "HCL James Martin is setting standards in system redevelopment. The company is dedicated to delivering world class solutions along with unparalleled training, services, and support, to keep business systems operating at peak, through, and beyond the year 2000. We are the only company in the world focussed on delivery of systems redevelopment solutions; it is our area of expertise."

HCL James Martin will utilize two of its patented methodologies—TSRM and off-sourcing—to tap the roughly US $ 600 billion 'Year 2000' solutions market. According to HCL officials, TSRM is recognized worldwide as an industry standard for solving problems that are expected to be thrown up by '00' in date fields in the year 2000.

Orient Ties Up with ABT Corporation

US-based ABT Corporation, a world leader in project management software, has appointed Orient Information Technology of Bombay as the distributor in India of its entire product line.

According to Orient officials, ABT has a client base of over 150,000 including such well-known names as Anderson Consulting, Cap Gemini Sogeti, Oracle, and Texas Instruments. The ABT product line includes Project Workbench, a powerful project planning, analysis and scheduling tool; Method Architect, a methodology authoring and customization tool; Project Bridge Modeller, a profiling, planning and estimation tool; and Metrics, a measurement and metrics tool.



(Left to right) Tony Barry, Chris Murray, Ke... Sheth and M.N. Chaturvedi signing the distribution agreement.

According to the terms and conditions of the contract, Orient will distribute the ABT Corporation product range in India and provide professional services in technical support, tool training and implementation, methodology customization, quality management, and project management training.

Orient Information Technology, which specializes in outsourcing and software services and support, has offices and business associates in the US, Canada, Europe, and the Middle East.

In view of the liberalization wave in the country, more and more companies are realizing the potential of project planning software and tools.

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IN BRIEF

Koenig Appointed Microsoft ATC

New Delhi-based Microsoft India, a subsidiary of the US $ 6 billion Microsoft Corporation of the US, has appointed Koenig Solutions as its authorized training center for popular Microsoft software including Windows, Word, Excel, Mail, Project, and FoxPro. Koenig will offer intensive one-day training courses for corporate clients in northern India.

Says Rajiv Nair, MD, Microsoft India, "Microsoft applications are constantly upgraded to meet customer needs. Training and familiarization programmes play a very important role in the optimum utilization of these new Microsoft technologies. We have chosen a partner with Koenig because of its enlightened and flexible training methodologies."

Rohit Aggarwal, MD, Koenig Solutions, adds, "We are pleased to be associated with Microsoft, the biggest software provider in the world. It is the software, both operating systems and applications software, that runs the whole system. It is the knowledge acquired through training, that determines the value extended by the software. Our quality training supports businesses by increasing the quality and productivity of its employees."

Koenig Solutions has devised one-day training modules on Microsoft products. Koening also conducts modular training courses for up to two years covering basic computer knowledge.

IBM's Pentium Pro PC Server Launched in India

Bangalore-based Tata Information Systems (TISL), which markets and supports the entire range of IBM products and services in the country, has announced the availability of IBM PC Server 704, the latest Pentium Pro-based server offering from the IT giant.

PC Server 704 incorporates dual PCI bus technology in both array and non-array models. It also features a total of 17 storage bays supporting a maximum storage capacity of 26 GB. Memory can be expanded up to 1 GB. The server can scale from one to four processors.

Says Sanjiv Mittal, vice president, personal systems division, TISL, "We have a complete range of products on the PC server. IBM PC servers have industry standard architecture with mainframe features. These new offerings combine advanced PC technology with award winning systems management software. This will provide customers with exciting enterprise applications."

Atul Vijayakar, country manager, Intel India, adds, "With the Pentium Pro processor, Intel is poised to bring PC economies of scale to the enterprise server market segment. The seamless multiprocessing support of the Pentium Pro processor provides revolutionary performance and scalability for this architecture. IBM is exploiting these capabilities by delivering a server solution capable of running the most demanding enterprise applications."

HCL Frontline Launches Services

New Delhi-based HCL Frontline, the small office home office (SOHO) wing of the US $ 500 million HCL group, has launched two new services in the country. The services were earlier marketed as integral parts of Beanstalk, HCL Frontline's SOHO PC. As independent services, both Telesupport and Bulletin Board Service will be available to subscribers all over India.

Telesupport is a remote PC hardware and software support system. Subscribers can dial one of the nine support centers established by the company to receive expert advice on software/hardware-related problems. HCL Frontline experts can also access the subscriber's system with the help of a remote login software, and make the necessary corrections. Telesupport will be available to subscribers for popular system and application packages like MS-DOS, Windows 3.1, and Windows 95. It will also be available for all branded and non-branded PCs.

The Beanstalk Bulletin Board Service will support private and public e-mail at the national and international levels; online games, and access to Fidonet—an international BBS, BharatNet, and Echo-Mail. Beanstalk BBS is based on remote image processing software, which offers full color and high-resolution imaging on the screen.

ISO 9000 Clinic in Bangalore

New Delhi-based Quality Assurance Institute (India) (QAII), a joint venture between Quality Assuarance Institute, USA, and INTECOS, recently held a 'clinic' for software units in Bangalore. Under the programme, experts from KPMG Quality System Registrar and QAI's technical collaborator Apex Quality International, UK, diagnosed the effectiveness of the quality control systems followed by software developing companies, and suggested improvements. Addressed by Alan Smith, A-Pex, Rajiv Nag, QAII, and V. Kannan, KPMG Quality System Registrar, the clinic assumed proportions of an informal open house.



Rajiv Nag, Alan Smith, and V. Kannan addressing an open house in Bangalore.

The panel discussed key issues relating to the 'health' of an organization's ISO 9000 efforts, focussing on the three major ISO 9000 areas of planning, documentation, and deployment and certification. A-Pex is a leading ISO 9000 training and consultancy organization with offices in 7 countries.

Software Engineering on the Internet

Bombay-based Aptech, a leading computer education and training organization, has decided to offer a series of popular information technology and management courses on the Internet.

According to Ganesh Natarajan, the company will be investing Rs 100 million to set up comprehensive Internet and intranet facilities at the Aptech Research Center in Bombay.

To get a feel of the Internet, Aptech will provide access to national and international destinations at all its centers.

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Compaq Users to Enjoy SprintMail Facilities

SprintMail (Sprint RPG's e-mail service) will now be available on Compaq machines. The leading e-mail service with over one million subscribers worldwide, will be offered to Compaq users at a special discount of 30% on the total surcharge.

Compaq users can subscribe to the service without paying the subscription and installation fee. There is an additional 40% off on the security deposit.

SprintMail uses the advanced X.400 protocol, and is connected to all major private and public e-mail networks worldwide, including the Internet, and is compatible with DOS, Windows, and [illegible] platforms.

It works on a dedicated network of [illegible] kbps multi-patch leased lines, making [illegible] the fastest e-mail in India. SprintMail provides three flexible and cost-effective services—e-mail, fax, and telex, which can be used by simply dialing a local Sprint Mail access number from anywhere, 24 hours a day.

AWARDS/APPOINTMENTS

Hughes Software Systems

New Delhi-based Hughes Software Systems (HSS), the Indian subsidiary of Hughes Network Systems of the US, has been awarded ISO 9001 certification. Says Arun Kumar, president, HSS, "The true meaning of ISO certification lies in the standardization of activities and improved quality that will cumulatively give rise to a competitive boost to HSS. Our mission is to develop and provide software solutions, products, and services for the global marketplace in leading-edge technologies, and strive for the highest level of customer satisfaction and employee growth."

ISO 9001 certification denotes formal compliance with international quality systems and standards. ISO 9001 auditors require compliance under 20 categories. The system is administered through accreditation boards controlled by the international ISO committee.

Established in 1992, HSS has invested Rs 180 million in a software development facility in Gurgaon. The company specializes in the design and development of realtime embedded software for voice, data, and video communications, and other engineering applications. It executes software projects in digital cellular networking, satellite communications, enterprise networking, and network management.

Apple Computer

As evidence of its commitment to and impact on the design industry, Apple Computer was honored as one of "The Stars of Design" and was awarded a Lifetime Achievement Award for Technology by the Pacific Design Center, California's largest resource for the design and architecture professions. Apple became the first and only technology company thus far to receive a prestigious Lifetime Award which honors individuals or companies that have made significant contributions to the design profession.

"We are delighted to present Apple Computer with a Lifetime Achievement Award for Technology commemorating 20 years of innovative technology and industrial design excellence," said Andy Wolf, president of the Pacific Design Center, "There's no better computing platform than the Macintosh to empower designers to do their best work."

NASSCOM

Ashank Desai, CMD, Mastek, Bombay, hasa been elected president of the National Association of Software and Service Companies (NASSCOM). K.V. Ramani, MD, Future Software, Madras, is the new vice president, and Rajnit Rai Jain, MD, RS Software India, Calcutta, has been elected treasurer.



Ashank Desai.

Dewang Mehta will continue to function as executive director, while F.C. Kohli, deputy chairman, Tata Consultancy Services, N.R. Narayanamurthy, CMD, Infosys Technologies, and Harish Mehta, CMD, Onward Technologies, will continue to be members of the NASSCOM executive council as past presidents.

Desai has over 15 years of experience in the software industry. He has been the vice chairman of the Asian Oceanian Computing Industry Organization (ASOCIO), and has been associated with NASSCOM since its inception in 1988.

Ramani is also the chairman of the Department of Electronics Planning Committee. Jain, who has been closely associated with several professional organizations in India and the US, has more than 16 years of expierence in the software industry.

Siemens Nixdorf Information Systems India

Patrice Baranowska has been appointed MD, Siemens Nixdorf Information Systems, India.

Patrice started his career with Siemens Nixdorf in 1988 as sales director, Africa. In 1992, he was appointed international sales director (partners), and was made responsible for the company's business operations in Africa, the Middle East, and Latin America. He became the country manager [illegible] mens Nixdorf, India, in 1995 [illegible] fore joining Siemens Nix[illegible] Patrice held responsible posi[illegible] in Thompson CSF and the Ac[illegible] group.



Patrice Baranowska.

As MD, Patrice's primary [illegible] will be to make Siemens Nix[illegible] one of the top five IT companies [illegible] the country by the year 2000.

Bombay-based Siem[illegible] Nixdorf Information Systems [illegible] joint venture betweeen Siem[illegible] Nixdorf Informationssysteme, G[illegible] many, and Siemens India.

PSI Data Systems

S. Sadasivan has joined PSI [illegible] Systems as head (banking s[illegible] tions). He has more than 24 ye[illegible] of experience including eight ye[illegible] in the IT banking sector. Be[illegible] joining PSI Data Syste[illegible] Sadasivan was manager (com[illegible] er policy and planning departme[illegible] Union Bank.



S. Sadasivan.

Bangalore-based PSI D[illegible] Systems is an affiliate of Bull S[illegible] France. The company specia[illegible] in custom engineered softw[illegible] solutions, systems integration a[illegible] consulting. Company officials s[illegible] that it recorded a turnover of [illegible] 220 million during 1995-96.

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INDIAN SECTION

IT SHOWS

Exhibition/Fair	Brief description	Date	Venue	Contact
DYNAMIC COMPUTER FAIR	A fair on computer-related products.	14-16 June '96	Madras	K.K. Raman Rosy Tower, First Floor 7 Nangambakkam High Road Madras 600 034 Tel: 8263608/2580; Fax: 8282592
PC SHOW '96 & SW SHOW '96	An exhibition on PC hardware and software.	20-23 June '96	World Trade Center Singapore	Lines Exposition & Management Services 318B King George's Avenue, Singapore 208563 Tel: 2998611; Fax: 2998633
BUSINESS TO BUSINESS '96	Show on office products and services, including computer hardware and software, and communications.	3-6 July '96 5-8 June '96 & 18-21 Dec. '96 21-24 Aug. '96 17-20 July '96	Bangalore Bombay Ahmedabad Hyderabad	The Assistant Manager—Coordination Conventions & Fair India 157 Princess Street Bombay 400 002 Tel: 2060808; Fax: 2080171
VLDB '96 (Very Large Database Conference)	An international conference on very large database management. Topics include database engineering, data warehousing, implementation techniques, distributed and client/server databases, hypermedia and object-oriented databases, and so on.	3-6 Sept. '96	Bombay	P. Sadanandan NCST, 6th Floor, Major Tower Visvesvaraya Centre Dr Ambedkar Road Bangalore 560 001 Tel: 91(80) 226 3100 Fax: 91(80) 226 1531
CSI '96	An IT show targeting computer users. IT manufacturers and service providers will display their wares. Business opportunities can be explored.	Oct. 30- 3 Nov. '96	Bangalore	M. Dayanand 401, 4th Floor, M.B.C. 134 Infantry Road Bangalore 560 001 Tel: 5511511; Fax: 5562971
COMDEX/FALL '96	A major platform for buyers, sellers, and decision-makers. On display will be the latest in products and services, including computer hardware and software, multimedia, networking solutions, communications, Internet, education and training programs, computer-telephony integration, mobile and wireless computing, and ISDN-related hardware and software.	18-22 Nov. '96	Las Vegas	Business India Exhibitions Wadia Building, 17/19 Dalal Street Bombay 400 001 Tel: 2663449/1425 Fax: 2664364/2041974
IT ASIA '96	The number one IT industry show of the country with active participation of IT delegations from the US, Europe, and South East Asia.	6-9 Dec. '96	Pragati Maidan New Delhi	MAIT, PHD House, 4th Floor Opp. Asian Village New Delhi 110 016 Tel: 6855487; Fax: 685 1321
COMMUNICATIONS '96	An IT exhibition on communications products and technologies. Good platform for forging commercial and business alliances.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647688 Fax: 4633506/4648692
BROADCAST CABLE & SATELLITE INDIA '96	A major international exhibition and conference on professional camera, lighting, sound, movie and video production, post-production products, radio and TV broadcasting, and cable and satellite systems.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647688 Fax: 4633506/4648692

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10 Minute Guide to Lotus 1-2-3 4.0 for DOS

By Jenna Christen-Howard

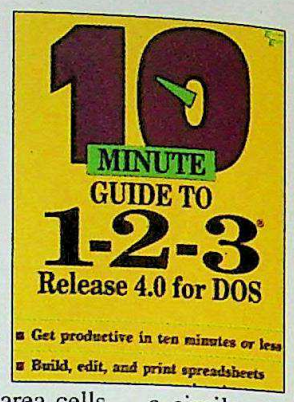
Price: Rs 75; Pages: 160

10 Minute Guide to Lotus 1-2-3 4.0 for Windows

By Peter Aitken

Price: Rs 75; Pages: 166

Prentice Hall of India, M97 Connaught Circus, New Delhi 110001



As the name suggests, these books are meant for readers in a hurry. They are part of a series of titles on popular software packages. The main aim of the series is to introduce novices and users with some superficial experience to the essentials of popular software packages used in business and profession. The books read like a whirlwind tour of an unknown city, with absolutely no time to tarry at intermediate destinations. If the titles in the series are popular, it is because they offer concise practical information on how perpetually busy users can extract the maximum from the packages, without referring to dreary manuals, or looking up electronic help.

It would be wrong to expect anything more than bare fundamentals, though the books are complete in themselves, and have been planned painstakingly to offer a comprehensive exposure to the functionalities and features supported by the concerned software.

Lotus 1-2-3 Release 4.0 for DOS is no exception to this general rule. After a short introduction, the user is rushed to elementary functions like starting 1-2-3, retrieving a file at startup, optional startup from Windows, invoking WYSIWIG (what you see is what you get) views, and exiting. The second chapter discusses the basics of a worksheet. The work area, cells, and addresses are dealt with cursorily, and the user learns the basics of cursor control within the worksheet.

Chapter 3 discusses the control panel, the status bar, and practical aspects of customization. The subsequent chapters cover menus, smarticons, data entry, ranges, formulas and functions, and add-ins. Functionality clusters like copying, moving, editing, and deleting cells, formatting, and printing are also co... ered. There ... chapters on ... creation of gra... multiple wor... sheet process... and on using ... Lotus 1-2-3 da... base.

10 Min... Guide to Lotus 2-3 Release ... for Windows ... a similar structure, though ... the name suggests, it addres... the Windows version of ... spreadsheet.

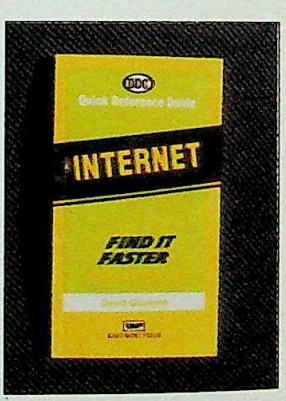
The most striking feature ... the books is the logical conti... ity between the chapters. T... step-by-step approach will st... beginners in good stead. A gu... companion for executives see... ing general familiarity with ... command structures of Lotus ... 2-3 for DOS and Windows. F... professional expertise thou... look elsewhere.

Quick Reference Guide, Internet

By David Gosselin

Price: Rs 99; Pages: 214

Affiliated East-West Press, 104 Nirmal Tower
26 Barakhamba Road, New Delhi 110001



This title is a sheer disappointment. If the purpose of writing the book was to offer a reliable quick-reference guide on the Internet, the author has failed miserably. Some of the definitions are shockingly incomplete. The hallmark of a good book—an invisible thread running through seemingly independent chapters—is conspicuous by its absence. It is at best a heterogeneous mix of unrelated concepts and expressions, and at worst, a nightmarish collection of randomly selected jargon explained with a degree of indifference that is shocking.

The Internet, as it has evolved in the last two decades, is gradually assuming proportions of a wild beast that defies centralized control. The jargon used directly or indirectly in connection with the Internet can fill the pages of a large dictionary. The least a quick reference guide should offer is a systematic treatment of exactly how the myriad services offered by the mother of all networks can be effectively exploited. The treatment must be systematic, because the subject is very complicated and it is easy to get entangled in webs of confusion.

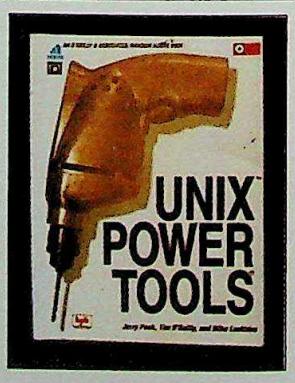
The book does cover differ... ent aspects of ... Internet, but ... approach is ha... hazard. Ever... where, the con... seems to be mi... ing. There are ... erally dozens ... books on ... Internet. If you ... a novice, and w... to acquire a bro... understanding ... the Internet and what it sta... for, look for a better title. If y... are well-versed in Internet ... gon, but wish to enhance or ... date your knowledge, this bo... is simply not for you.

Unix Power Tools

By Jerry Peek, Tim O'Reilly, and Mike Loukides

Price: Rs 395; Pages: 1,129

BPB Publications, B14 Connaught Place, New Delhi 110001



Unix Power Tools is not on Unix. It is a treatise on the utilities that Unix assimilated in its two decades of evolution. The book also covers add-on utilities that enhance the power of the popular operating system, without being an integral part of the software. *Unix Power Tools* takes a lot of things for granted. For instance, the user should be familiar with the kernel, shell and general command structure of Unix. Only the most essential aspects of Unix are discussed. The book concentrates instead on practical tips, scripts, and techniques.

Unix Power Tools includes a CD-ROM with free software programs for Unix power users. The programs are pre-compiled for Sun 3, SPARC, DECStation, IBM RS6000 (AIX), HP/UX, SCO Unix, and SCO Xenix.

The formidable size of the book need not depress the reader, as it is meant to function as a reference manual. Cross re... ences abound. Hypertext di... base links are available for ... tailed information. The book ... structured with an eye on ea... and quick reference. Proble... are stated and solved in one p... articles that are numbered w... in the concerned chapter.

The emphasis invariably ... on shell programming, alias... history mechanisms, and edit... tools.

A standard reference bo... for accomplished Unix use... though not necessarily for s... tem administrators.

—Hirendra Chan...

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INTRANETS HELP SOLVE THE PUZZLE OF SHARING INFORMATION

Remember how satisfying it feels to fit into place the final piece of a jigsaw puzzle? All the hard work is already done, and you finally get to see the results.

Well, businesses around the world, having spent a decade investing heavily in personal computers, networking and training so that they can share information easily, are about to fit a piece into the puzzle that will complete the picture—with excellent results.

The missing piece has name: "intranet." It's the latest computer buzzword—and for good reason.

An intranet is an internal corporate or organizational network that uses Internet technologies to let employees browse and share electronic information remarkably easily. An intranet is a private version of the Internet's World Wide Web, but it's available only to people inside the organization.

On a Web page, various words, buttons or pictures serve as links to other pages. For example, if the word "Paris" is underlined in the text of a Web page, clicking on it will take you to information about the French capital.

Using the Web is a simple, even enjoyable, way to sift through information.

Eventually the biggest impact of the Web will be how companies use it to stay in close contact with their customers. And it will be an increasingly important way for corporations to stay in touch with investors. Apple, Intel, J.P. Morgan, Microsoft, and many other companies already publish their annual reports on their Web sites.

But over the next 12 or 18 months the real pay-back to the typical business will come from using intranet Web sites to give employees the information they need to be more effective.

Finding electronic information inside a company or organization today can be a real puzzle. Ironically it's often harder to navigate your own network than it is to use the Internet to locate information about an outside organization.

Typically, to use a conventional corporate network, you first must know the name of the file that contains the information. (Until recently, these names were restricted to eight characters, which kept them fairly nondescriptive.) You also must know the name of the file's folder or directory, disk and server.

For a computer expert, finding files and sharing them across a network becomes second nature.

But the task can be a pain, even for an expert, when somebody else changes the name or location of a file, or changes its content. And for the non-expert, finding "lost" information can be particularly aggressive—or even impossible.



"Eventually the biggest impact of the Web will be how companies use it to stay in close contact with their customers. And it will be an increasingly important way for corporations to stay in touch with investors. Apple, Intel, J.P. Morgan, Microsoft, and many other companies already publish their annual reports on their Web sites. But over the next 12 or 18 months the real pay-back to the typical business will come from using intranet Web sites to give employees the information they need to be more effective."

What you really want is a page of text that describes what's going on so that, as you browse from one location to another, you have a guide to the content and location of files.

This descriptive text, explaining how information is organized, is exactly what an intranet provides. Once you see a description of something you want to view, you just click on it to follow the link. I became a believer through experience. We have published thousands of pages of internal information on Microsoft's corporate intranet. Here is an example of how well it works for us.

A marketer interested in sales figures clicks a link on her computer desktop, which brings to the screen a page that reminds here of various ways to analyze sales. The page tells her how up-to-date the data is and reminds her of restrictions on passing the information around. Getting the actual information is just one more click away.

I was amazed to discover that certain sales-analysis data is being accessed five times more often now that it can be reached through our intranet. This is a remarkable change, considering that the files weren't all that hard to reach before and that the employees using them are sophisticated about computers and strongly motivated to study the data.

From a manager's point of view, perhaps the best aspect of an intranet is that it doesn't take much effort or investment to get one going. Businesses that have networked computers already have everything they need. The only expense is to have an employee write the descriptive pages and links.

Most word-processing programs and many other productivity software applications already offer the ability to create Web pages with links. Special software to help create and manage large numbers of linked pages is available from many sources. To read the pages, employees can use applications they already know, or one of the free "browser" software packages.

Personal computing is rapidly evolving toward a Web-based metaphor, in which any folder (directory) can be viewed as a Web page. When you look at the contents of a folder, instead of seeing just filenames or icons, you'll also see descriptive text.

The descriptions may prove so helpful that in the near future when a folder doesn't have any text, you may find yourself complaining. "Hey, put some explanation in here. Help me know what this does and how it works."

When I'm asked whether a company should do more with computers, I'm not always sure since it depends on the specific situation. However, for every business with PCs there's now a clear opportunity.

So perhaps my most timely general advice is: Get an intranet going in your company. It's a great tool and you've already paid for it.

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EDITORIAL

By Kirtimaya Varma

Roses from Penrose's Pen

The mind and matter phenomena (or are they a single phenomenon?) have evoked intense speculations and discussions for ages. We now have some understanding about matter. I think the single most important event that gave us an insight into matter was the formulation of the Periodic Table. At one stroke the Table explained why the global attempts during the middle of this millenium to transform baser metals into gold was such a disastrous failure. What the Periodic Table was to matter, artificial intelligence (AI) is said to be to the mind. It is believed that success in AI would provide the key to the mysteries of the human mind. The workings of the human mind, or for that matter even the human brain—which forms the matter foundation for the mind—have remained more or less a total mystery inspite of extensive researches. Many scientists and psychologists and saints say that the world of individual consciousness as is known today is less than 10% of the mind's total range; indeed, one uses an insignificantly small part and potential of his mind during his entire life! The AI approach sees the mind as software, housed in the "hardware" of brain. In other words, brain, mind, and consciousness are ultimately nothing more than computing.



Roger Penrose, the Rouse Ball professor of mathematics at Oxford, challenged this viewpoint in his book *The Emperor's New Mind*, which was recently listed among the hundred most significant books produced in the last 50 years. Penrose has continued his search for the missing science of consciousness and has now come out with a sequel to his earlier book. *Shadows of the Mind*, as the new book is called, concludes, in general, that "human understanding and insight cannot be reduced to any set of computational rules." This conclusion rests on a discussion of mathematical understanding, which employs Godel's celebrated theorem stating that no consistent formal system can prove all the true propositions of ordinary arithmetic. If there are propositions of arithmetic whose truth is accessible to human intuition, but cannot be established within a system of rules leading to proofs, then these rules cannot be all there is to mathematical understanding. Penrose says that there is a non-computational ingredient in the mind rooted in a non-computational physics. This non-computational physics, according to Penrose, will provide the clue to many of the imponderables today.

This theory precludes any relationship between mind and machine, or for that matter between mind and AI. Putting AI into computers was said to be aimed at making computers with a mind so that they could think and act like a human being. There was a *faux pas* here. We embarked upon the task of building AI on the pattern of the human mind with hardly any understanding of the human mind. Is it surprizing that the last 40 years of AI research—the expression *artificial intelligence* was first coined at Dartmouth College, Massachusetts, in 1956—has yet to yield any concrete results? There is yet no machine which can even remotely rival the human brain, which has 10 trillion circuits packed into an area of grey matter less than the size of a small cabbage. And what is worse is that there is not a single ray of hope that even in distant future we can build a machine having even a semblance of the human mind. If AI has attempted to shed light on the nature of human intelligence by simulating it, with the eventual aim of replicating it, or even surpassing it, then in 1996 we find ourselves farther from our goal than in 1956.

Let us take one example. It is chess which has highlighted that a difference between the human brain and the computer that can perhaps never be fathomed is the experiential information that the brain gathers from the first moment of memory. This information transmutes into knowledge when recalled with the purpose of using it in a situation. In the game of chess, humans tend to draw upon their experience in the recognition of meaningful chess patterns in order to, for example, exclude at a glance disadvantageous moves. But the computer solves such chess problems through the application of sheer brute force of computing power.

I think its time that our entire approach to AI is reconsidered so that we don't waste resources in imaginary pursuits. As said above, for many decades a colossal amount of time, money, and energy was spent in trying to convert base materials into gold without understanding the basics of matter. Perhaps a similar effort is being made today: we have been trying to build "mind" with hardly any understanding about the mind. Billions of dollars have gone down the drain during the last four decades of AI research, and who knows how much good money would be thrown after the bad in our obstinacy to make computers think like human beings. If only this money had been spent in more down-to-earth projects!

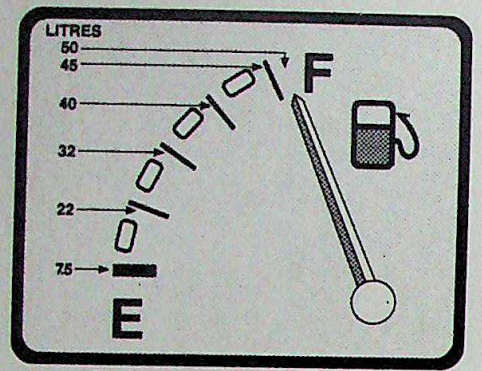
Interestingly, some writers (like Jay David Bolter in *Turing's Man*, 1984) have pointed out that throughout history the brain has been thought to operate like the leading-edge technology of the era, and it has been variously thought to work like a hydraulic piston, clock, mechanical telephone exchange, and so on. This habit of ages has come down to us. As the computer belongs to the leading-edge technology today, we are comparing the human brain with it. Who knows the computer doesn't at all work like the human brain.

In this context the observation of AI critics Hubert and Stuart Dreyfus in the book *Mind Over Machine* (1986) is very valid: "AI has failed to live up to its promise, and there is no evidence that it ever will." Theodore Roszak, author of *The Cult of Information* (1986), comes down more heavily on AI: "AI's record of barefaced public deception is unparalleled in the annals of academic study." Penrose's idea of noncomputational physics providing the clue to understanding brain, mind, and consciousness bears a striking similarity to the Vedic thought that "the real world" can be known not through reasoning but through intuition. The path to this intuition is not strewn with roses; it's so hard that in any age hardly a few men undertake this journey. Nobody knows how many succeed. Can man's machine succeed where god's man hasn't? □

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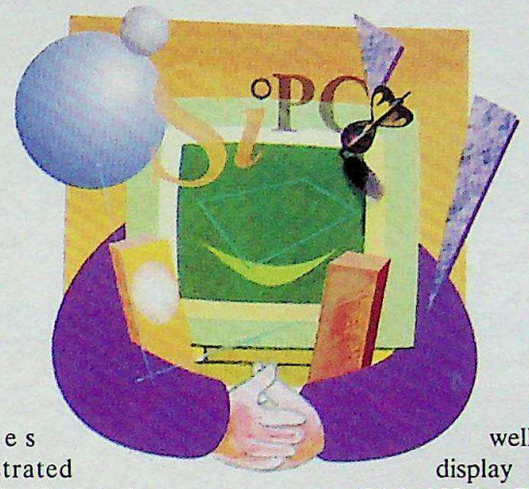
more on highways. Contact any of our dealers and put the Cielo to the test. Please do it for one very simple reason. Yourself.
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Trends

TRENDS & TECHNOLOGIES SHAPING THE PERSONAL COMPUTER MARKET

The Simple PC

New hardware heads for the living room.



More than 3,000 hardware engineers gathered for the annual Windows Hardware Engineering Conference in March to learn details and witness demonstrations of a radical new kind of PC based on Microsoft's Simply Interactive PC (SIPC) initiative. Dubbed "OnNow PCs," the new machines will be designed to turn on instantly and to operate multiple peripherals transparently.

Compaq, Hewlett-Packard, Intel, Phoenix, and Toshiba are all developing products designed to advance the SIPC initiative. And many new technologies, especially simple ways to connect peripherals, appear headed for marquee-level status in conjunction with the SIPC initiative.

According to Microsoft's Bill Gates, a recent MIT poll revealed that 8 percent of the population designated PCs as "an invention that they couldn't live without," while over 50 percent of respondents classified cars and light bulbs as such. Gates described his desire to see PCs move to an over-50-percent response level in future versions of such a poll. "Hard work lies ahead in the hardware community to make the PC more like an appliance—turned on immediately, and hassle-free," said Gates.

The evolutionary advancement of the PC platform, which initially centered on applications software, will increasingly center on information consumption—Web browsing, movie watching, and so on. Figuring prominently in Gates's vision of SIPC devices are large screens, multiple peripherals, serial buses, instant-on features, and advanced multimedia capabilities built on Microsoft's ActiveX and DirectX initiatives.

SIPC machines will also take on radical, new "sealed-case designs." Hewlett-Packard's prototype resembles a VCR, but is, in fact, a PC with Universal Serial Bus connections and IEEE 1394 connections, in both front and back, for daisy-chaining multiple peripherals.

Gates demonstrated the device by playing sound effects, which he sent around the room to various speakers using a joystick. He also showed a living-room-ready, 31-inch display running high-resolution, virtual-realty games in 3-D, as well as a large display running Digital Video Disk–based movies, with the sound bouncing around the room to various speakers. DVD and Microsoft's ActiveMovie API have starring roles in Gates's vision of SIPC as a movie platform.—*Sebastian Rupley*

Cyber-Cellular Phones

Wireless e-mail, Web access.

Be-all, end-all wireless-communications technology always seems a couple of years away. Phone carriers, manufacturers of wireless gadgets, and communications giants are constantly upgrading infrastructures and debating one standard's promise over another's ubiquity—all in an effort to attract millions of potential customers for wireless services. Now, several companies are turning the spotlight to a proven crowd pleaser—the Internet—with cyber-cell phones.



WIRELESS INTERNET: *Mitsubishi's MobileAccess is a cellular phone, pager, modem, and fax.*

You probably won't surf the Web with these new hybrid phones, but you will be able to send and retrieve e-mail—by far the most popular Internet activity. Motorola is one of the first companies to capitalize on the idea. Its new Wireless Internet Service—based on Code Division Multiple Access, one of the several digital standards vying for dominance in the U.S.—lets cellular phones retrieve e-mail, weather forecasts, stock prices, and sports scores via the Internet.

Mitsubishi's MobileAccess phone uses the analog Advanced Mobile Phone Service system and Cellular Digital Packet Data technology for paging, e-mail, fax, and voice services. And since MobileAccess phones run TCP/IP, the networking protocol that runs the Internet, they can access both the Internet and private intranets.

"Though high prices may delay American consumers' entry into this market, these phones will provide another way for mobile business users to communicate quickly via the Internet," says Dataquest analyst Clint McClellen.

Other companies, such as L.M. Ericsson and Nokia, are developing hybrid phones for the European market, where a digital standard, Global System for Mobile Communications (GSM), is in place. Nokia's upcoming cyberphone has a handset with a keyboard and screen, a personal information manager, wireless fax capabilities, Web access, and wireless-modem support for connection to notebooks—all for about $2,000.—*Angela Hickman*

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PIPELINE

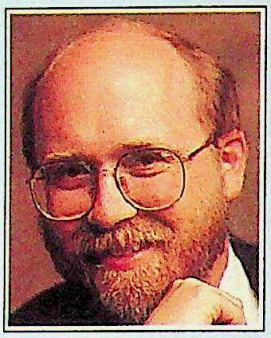
By Jake Kirchner

Good Government Doesn't Come Cheap

Contrary to the popular wisdom of the PC industry today, politicians are not stupid. I spent 15 years in Washington covering high-tech issues, both on Capitol Hill and throughout the federal bureaucracy. In that time, I saw a lot of decisions that adversely affected the creators and users of computer and telecommunications technologies, but I never found the legislators and regulators making those decisions to be ignorant. Attaining national political power is difficult; stupid people need not apply.

In the "old days"—when computing primarily meant IBM and a few other large firms—the major vendors were intensely involved at every level of the federal government. Through associations, lobbies, and the personal activities of top company executives, the industry participated constantly—and effectively—in congressional hearings, regulatory proceedings, and lawsuits related to the technology business.

To a great extent, now that the computing industry is led by companies like Microsoft, Novell, Netscape Communications, Sun Microsystems, and America Online, we've lost that involvement in government. We go to Washington only when some agency does "something stupid" and tries to break up Microsoft, or (depending on your outlook) refuses to break up Microsoft, or moves too quickly or too slowly into telecommunications-industry deregulation. At that point, any outcry is way too late for intervention.



For the PC industry, the supposed cure for bumbling bureaucrats is electing politicians who "get it."

For the PC industry, the supposed cure for bumbling bureaucrats has been to elect politicians who "get it" when it comes to the benefits of technology. You'll remember that the leaders of Silicon Valley were big supporters of the Clinton-Gore election campaign four years ago. You're probably aware that Republican kingpin Newt Gingrich is a big fan of new media and the convergence of computing and communications technologies.

So, how do we explain corporate depreciation and capital investment regulations that hobble the growth of PC hardware and software companies? How do we explain the Communications Decency Act and the current administration's willingness to support it?

These days, every industry conference I attend occasions discussion about the perceived dangers of our ignorant government leaders. At Esther Dyson's annual PC Forum recently, Netscape president and CEO Jim Barksdale declared, "It's dangerous if people know so little [about technology] but are regulating it."

Dyson, for her part, responded that "this rhetoric is doing more harm than good. Some people want control, some people want to protect children, but we tend to term all of them as right-wing nuts." She's right. The question is, what do we do about it?

Remember that many people in this country (and a few in Washington, D.C., no doubt) regard Bill Gates, Jim Barksdale, and the like as elitist and unconcerned about the possible adverse effects of technology on employment, international trade, and the moral development of our children. Calling those people ignorant isn't going to help.

The basic tenet of our country's republic is that we are the government. But we can't be the government if our only contribution is dashing into a voting booth every two years.

The Internet Shakeout

Anarchy, utopia, or something in-between?

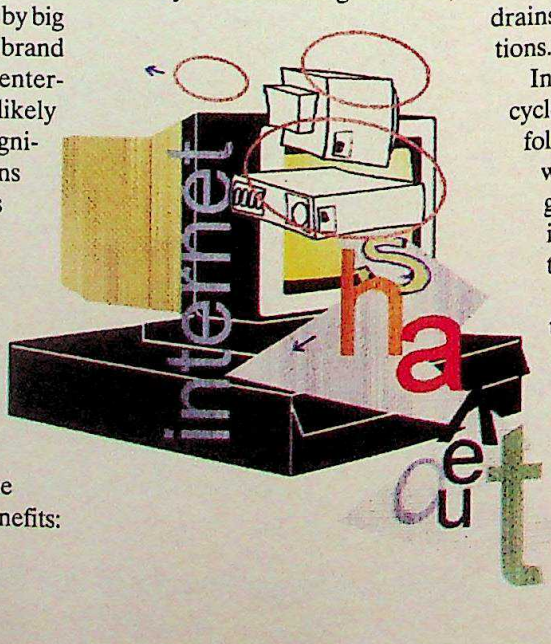
At this stage in the Internet's evolution as a form of communication and commerce, we're merely throwing spaghetti against the wall to see what'll stick. Bob Gill, an Internet analyst with the market-research firm Gartner Group, is in the business of predicting just who ends up sticking around—and who ends up on the floor.

It's not as rosy a picture as some may think. As the transport mechanism provided by Internet service providers is driven down to commodity pricing, content owners will likely have the real power on the Internet. Gill predicts that 80 percent of the thousand or so ISPs in business today will eventually drop out.

The thousands of "content wannabes," as Gill calls them, will become overshadowed by big media companies wielding brand recognition. "The leading entertainment aggregators will likely leverage their brand recognition into powerful positions on the Internet," explains Gill. The small content developers won't disappear completely, but they will sell their products to big media companies.

Gill has constructed three possible scenarios for the Internet's next step. In the most unlikely, the Internet leads to utopian benefits: bandwidth is plentiful; applications, free and instant. International regulations are relaxed, and Internet literacy becomes the norm.

In another unlikely scenario, anarchy causes a strong backlash, and the Internet becomes a no man's-land in which information attack becomes sport. The overwhelming number of applets and plug-ins makes the Internet dysfunctional. Electronic borders are closed as intellectual wealth drains away from developed nations.



In the most likely scenario, cycles of explosive growth and followed by corrections. Bandwidth is affordable, but gateways between corporate intranets and the global Internet are heavily guarded.

Gill predicts that Internet technology will "be used increasingly for intranets and interenterprise communications linking employees, customers, suppliers, and business partners."

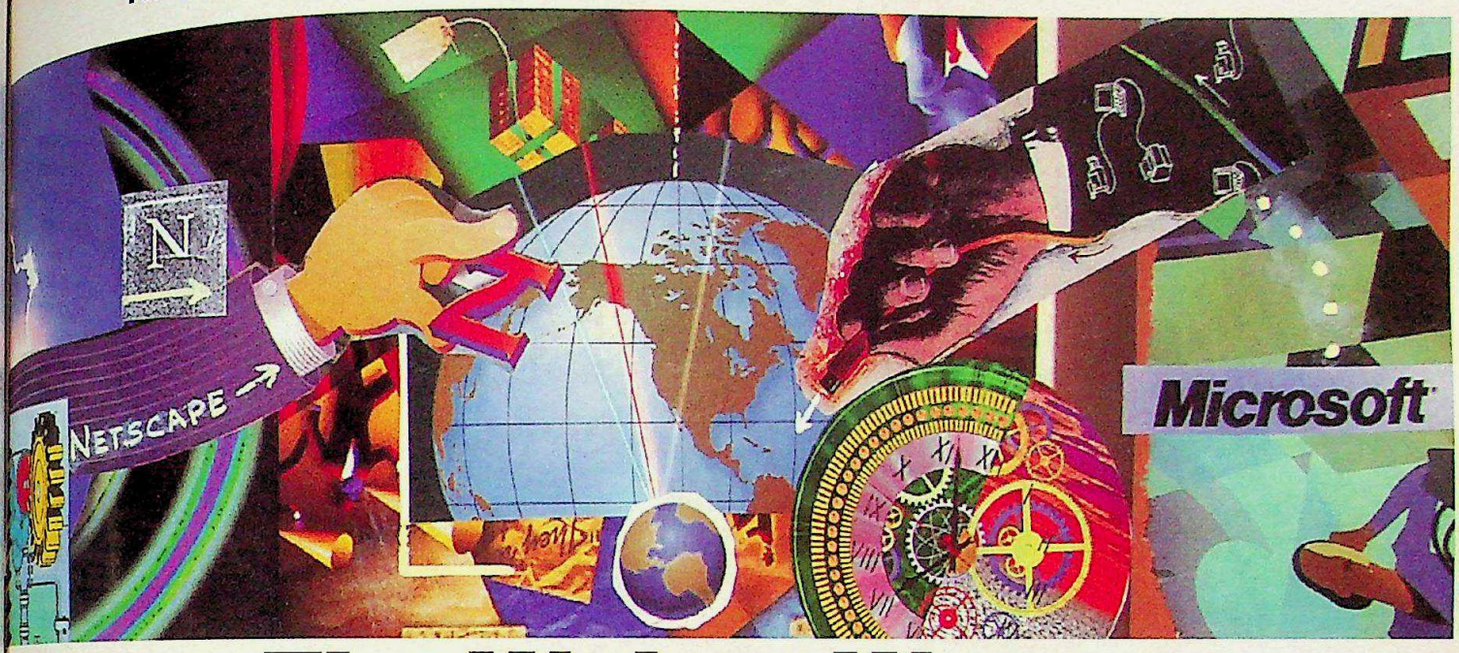
Carol Levin

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS



The Web at War

The Battle for the Future of the Internet

By Michael J. Miller

Every time you connect to the World Wide Web, it seems that you can find another site that goes far beyond the Web's original concept of being a way to present static pages viewed through a browser. Today, the most compelling Internet destinations offer animation, sound, and video, customized content, or ways for Web consumers to buy products in cyberspace. The net result is that the era of the interactive Web is dawning.

Not surprisingly, Netscape Communications Corp., the maker of Navigator—the leader with 80 to 90 percent market share for browsers—wants to continue to set the pace for the emerging interactive Web. Its HTML extensions, notably those for presenting tables and frames, have become standards for Web designers. Netscape's Navigator plug-in architecture is the de facto standard for adding multimedia pizzazz to a Web site, and its support for Sun Microsystems' Java is the most popular way of embedding interactive elements into Web pages.

Nothing on the Web stands still. Netscape is promoting three ways of adding even more excitement in the future: Live Objects for integrating multimedia, server-based Java, and NSAPI, its server-applications interface.

At the same time, Microsoft, the dominant supplier of operating systems, is playing catch-up and wants to control the direction of Web development. In its next-generation Web browser, Internet Explorer 3.0, Microsoft supports some Netscape standards, such as the HTML extensions, Navigator plug-ins, and Java. But Microsoft is adding its own take on the future of the Web by proposing new standards. The most notable are ActiveX, which adapts Visual Basic–style objects (.OCXs) for the Web, and ISAPI, its Internet Server API.

Perhaps most important, Microsoft plans to integrate Internet Explorer into Windows 95. This will not only streamline setup but will let you look at your hard disk and the Web as a single unit.

Such an assault is nothing short of a direct challenge to Netscape. But Netscape continues to have the advantage, as most Web sites are designed for its browser. Still, the Web is evolving rapidly, and the rate at which innovations are adopted by Web-site developers may well determine which "standards" truly become standard and which are forgotten.

In the pages that follow, we'll take a close look at each company's battle plans, armor, and chances of success on this battlefield. We'll start by examining the strategies and the latest browsers from Netscape and Microsoft, as well as their newest servers, Netscape FastTrack Server and Microsoft Internet Information Server Version 1.0.

Then we'll look at the newest Navigator plug-ins and how they compare with ActiveX and Java. Finally, we'll examine two ways of doing business on the Web: sites that support credit card transactions and those that use one of the emerging digital-cash schemes. A series of book reviews, some of which show you how to use digital cash on your Web site, follows.

Regardless of whether this is a protracted battle or one with a quick resolution, one thing is certain: The Web will not stay static.

SPECIAL REPORT

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All the Web's a Wallet—Or Soon Will Be 30

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WEB BROWSERS

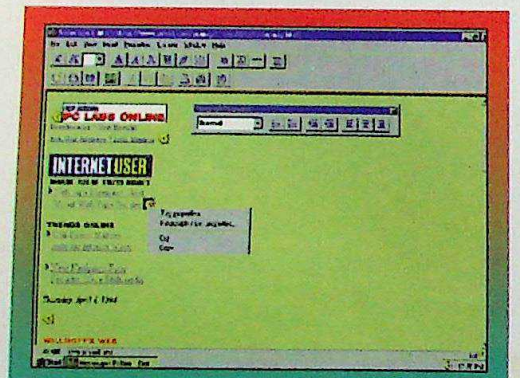
The Browser Battle Between Microsoft and Netscape



By John Clyman and Larry Seltzer

The battle lines have been drawn for a clash over who will shape the future of the World Wide Web. On one side stands Netscape, creator of the enormously popular Navigator browser, with an impressive array of Internet armor and artillery. On the other side is Microsoft, which is trying to use its leadership role in desktop operating systems to make an online strike with Internet Explorer. The victor will likely determine not only which Web browser you'll use in the future but also what the Web will look like.

Neither Microsoft Internet Explorer 3.0 (available at *http://www.microsoft.com)* nor the Atlas version of Netscape Navigator (available at *ftp.netscape.com)* we looked at for this roundup were feature-complete. Each will be finished and officially released in the coming months. And each developmental program offers insight into its company's intended strategy and direction for providing Web interactivity.



Netscape Navigator Gold provides a near-WYSIWYG view of what your emerging Web page will look like.

At first glance, Internet Explorer 3.0 (IE 3.0) is the more impressive program because it integrates so tightly with Windows 95. Microsoft's ultimate goal is to replace the Windows 95 Explorer entirely, using IE 3.0 as an interface for the Internet, a corporate intranet, and the contents of your local disk. During evaluation, we had trouble moving among views, but on the whole, we were impressed with this concept.

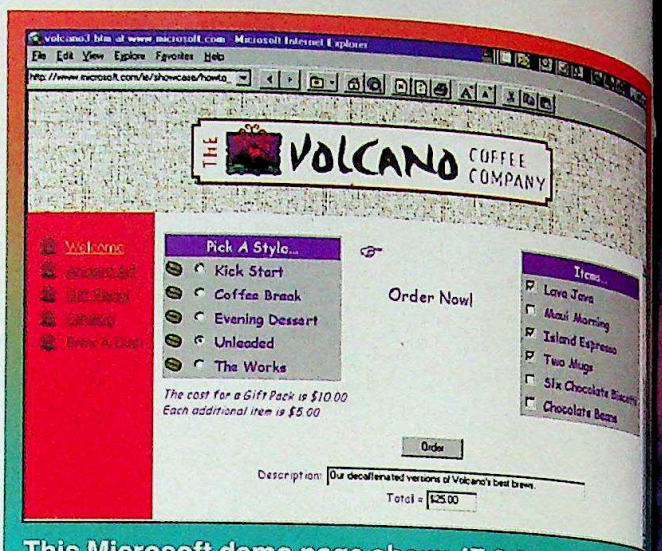
CATCHING UP

The IE 3.0 browser catches up to Navigator by incorporating its HTML extension for frames, which allows Web developers to segment the browser canvas into multiple independent panes. To that foundation, IE 3.0 introduces its own HTML extensions, including a FACE parameter for the existing FONT tag, which lets designers more accurately control typography by specifying a prioritized list of alternative fonts.

As a result, IE 3.0 currently draws from a broader set of extensions than Atlas can. Such capabilities are a prelude to Microsoft's use of CSS (Cascading Style Sheets), a proposed standard that lets both author and reader define preferences for fonts, spacing, and layout. At press time, Atlas didn't support these extensions or earlier Microsoft-inspired ones, such as background sounds; marquees, which can enable scrolling text; and watermarks.

Navigator was ahead of IE 3.0 with support for Sun's Java, an object-oriented, platform-independent language. Java has enabled early Web interactive content, from stock tickers to database front ends.

Microsoft's answer is ActiveX technology, which produces essentially Internet-enabled OLE custom controls (.OCXs) that provide in-place, interactive viewing and editing. ActiveX controls are not incompatible with Java; in fact, Microsoft plans to use wrappers to make Java applets behave like ActiveX objects.



This Microsoft demo page shows IE 3.0 s use of borderless frames and the company s VBScript.

Two keys to infusing interactivity into Web pages are moving beyond server CGI scripts and developing client-side scripting languages; the latter lets developers provide interactivity within the HTML source code. This can free the developer from the complexities and performance problems of using server-based CGI scripts, which are memory-intensive and can't communicate directly with the server.

For example, forms processing traditionally required that the user fill in a series of fields and send a request to the server for processing against a database. Scripting could let the designer notify the user in response to inappropriate entries or provide dynamic information, such as which items on an order form are in stock .

Navigator provides direct support for JavaScript, a Java-based language that enables these kinds of capabilities and more. Though IE 3.0 has added JavaScript support, Microsoft's real thrust is in using its Visual Basic–derived VBScript language.

In addition, both Microsoft's Internet Server API (ISAPI) and Netscape's NSAPI address the limitations of CGI scripts. These APIs create ways for a server-based application to run in the context of the server, which can streamline operations, lower system overhead, and allow easier and more detailed communication with the server. Both achieve the same effect, but ISAPI extensions run as .DLLs, while NSAPI runs directly on the Netscape Server.

TURNING THE HTML PAGE

Expect to see new Web-page creation tools as well. Netscape's flagship content-creation product is its $79 Navigator Gold 2.0, which features a Web-page editor that provides a near-WYSIWYG view of your work. The familiarity of Navigator Gold's look and feel is offset by its inadequate support for HTML tables.

Microsoft has two current content-development offerings and one in the wings. Internet Assistant for Word for Windows is available as a free download. It lets you browse and edit Web pages using the familiar Word interface. Microsoft's FrontPage ($149; $99 for Microsoft Office users) uses a desktop publishing metaphor and is a step up in the page-creation ladder; evaluation copies are available from Microsoft's Web site.

Internet Studio, which started out as a creation platform for The Microsoft Network, will likely be the company's tool for professional Web designers. When it's finished, Internet Studio will in-

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grate ActiveX controls and CSS, is expected to support a multitude of HTML extensions and VBScript, and will likely enable collaborative Web development—a Web first.

Netscape's opportunities for developers revolve around the company's browsers and servers. For instance, the Navigator browser is automatable through OLE with several object interfaces defined on its Web site *(http://home.netscape.com/newsref/std/oleapi.html)*.

EASIER-TO-SWALLOW JAVA

An environment for designing and debugging Java code is crucial to developing interactive Web content. Microsoft is building on its programming tool, Visual C++, to produce the Java-aware Jakarta environment. Third-party compiler vendors such as Borland and Symantec are already shipping Java programs that are more visual as well as "just in time" compilers to speed Java's execution.

Whose vision of the Internet's future will dominate in this war of the Web? At this point it's hard to say. Netscape's nearly universal acceptance is an enviable base from which to launch an attack, while Microsoft's Windows 95 integration and continued enhancements to HTML offer unprecedented ease of use and flexibility for developers and users alike.

No matter which company emerges as the victor, Web users will be the real winners, with rapidly evolving products that result in more interactive and interesting Web sites.

Netscape Navigator Atlas. Requires: 8MB RAM, 6MB hard disk space, Microsoft Windows 95. Netscape Communications Corp., Mountain View, CA; http://home. netscape.com. *(Indian partners Microland, Bangalore; Wipro, Bangalore.)*

Microsoft Internet Explorer 3.0. Requires: 8MB RAM, 3MB hard disk space, Microsoft Windows 95. Microsoft Corp., Redmond, WA; http://www.microsoft.com. *(Indian subsidiary Microsoft India, New Delhi; Indian partners Datapro Infoworld, Pune; Godrej Trading, Bombay; Sonata, Bangalore; TUL, Bombay.)*

INTERNET SERVERS

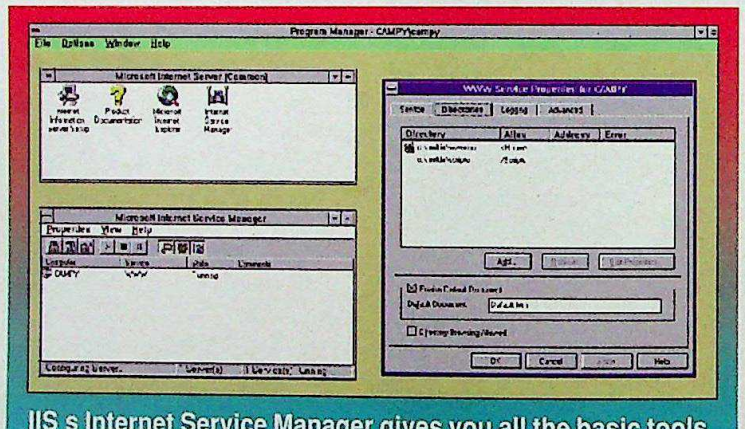
At Your Service: FastTrack vs. Internet Information Server



By Tony Pompili and Robert P. Lipschutz

Even with scads of software available to anyone patient enough to wait out a multimegabyte download, the Internet today proves the old saw that there's no such thing as a free lunch.

Take Microsoft Internet Information Server Version 1.0 (IIS). The Web-server software is available for free from Microsoft's Web site *(http://www.microsoft.com)* and delivers all the basics for developing a professional Internet presence. In addition to services for the Web, FTP, and Gopher, IIS offers tight integration with Windows NT, Secure Sockets Layer (SSL) security, and a copy of Microsoft's Web browser, Internet Explorer.



IIS s Internet Service Manager gives you all the basic tools for administering Web servers in a familiar interface.

IIS falls short, though, in terms of platform support and administrative and content-creation tools. At first, the price may seem tough to beat, but IIS may end up costing more than other Web-server packages because of the other components you'll need.

Netscape FastTrack Server is designed for those who are more concerned with content than with the ins and outs of running HTTP servers. The $295 FastTrack package is a nonstop route to a sophisticated site, as it includes an HTTP server, Navigator Gold 2.0's authoring tools, and support for Java and JavaScript.

HERE AND NOW

At press time, IIS offered at least one major benefit over FastTrack: It is in final form. For this roundup, we looked at the beta version, 2.0b2, of FastTrack; the final product should be available by the time you read this, according to Netscape. The software is available from the company's Web site *(http://www.netscape.com)* for evaluation. These two programs take their places alongside The Internet Factory's Commerce Builder, IBM Internet Connection, Spry SafetyWeb Server, O'Reilly & Associates' WebSite, and Quarterdeck's WebStar in the crowded Web-server market.

FastTrack provides all the features corporate customers expect, combined with easy-to-use administration and content-creation tools. Installing FastTrack is easy, as long as the server already has access to an IP network or Internet service provider.

During setup, you fill in the server name, administrator's name, and password. FastTrack's configuration wizard does the rest. We found that IIS's graphical setup routine was just as straightforward; FastTrack and IIS each took about 10 minutes to configure.

FastTrack wins the shoot-out with IIS in terms of operating-system support: FastTrack runs on Windows NT and a good selection of Unix variants: Hewlett-Packard's HP/UX, IBM's AIX, SGI Irix, and Sun's Solaris Unix. By contrast, IIS runs only on Windows NT Server, which costs $[illegible]. You can buy IIS as part of the $[illegible] NT Server Value Pack, which includes the server software, Windows NT Server 3.51, and client-access licenses. What IIS lacks in terms of breadth of [illegible] choices, it makes up for in terms of integration into Windows NT.

Both FastTrack and IIS [illegible] built-in SSL security. IIS and Internet Explorer use Netscape's SSL 2.0, and FastTrack integrates Version 3.0, which supports client-side security certificates and advanced Internet-ready access control.

As far as page-level security goes, you can designate pages on your IIS Web site as privileged applications that require user IDs and passwords for access. By contrast, FastTrack bypasses Windows NT's built-in security in favor of its own access-control system for restricting users and groups of users to specific directories.

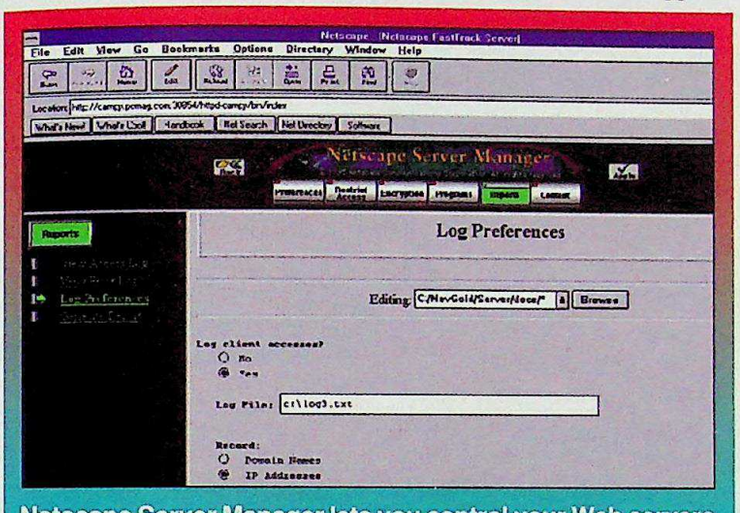
Although this adds another layer of administration to FastTrack, it offers more flexibility compared with IIS. One benefit of Netscape's approach is the ability to apply Internet-specific access controls to a server's directories or files so that you can restrict access to a server, directory, or file name—or any combination—based on a host name or IP address. But with IIS we were able to block access by users based on their domain names as well.

Because IIS uses Windows NT's directory services and security system for restricting server access, there's no need to create a new list of users and groups. To add a new user, you simply create a new server account and IIS automatically recognizes the change.

FastTrack actually runs [illegible] separate services: the [illegible] Web server that clients connect to and an administration server through its own unique TCP/IP

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Netscape Server Manager lets you control your Web servers via the Navigator browser from anywhere on the Internet.

you protect the administration server from unauthorized access with a user name and password; SSL security can also be added. A big bonus is that you can install several instances of FastTrack on a given machine, while only one version of IIS can run on a system. This multiple-personality potential lets FastTrack users consolidate their Web farms into a single machine or just a few machines.

One copy of the administration server manages all of the FastTrack servers on a single system. Though this eliminates the need to jump among multiple administration programs, you're still basically administering each server individually.

With FastTrack, all administration tasks are performed through Netscape Server Manager (NSM) and your Web browser, assuming it supports frames and JavaScript; we used Netscape Navigator. On the positive side, browser-based administration lets you perform tasks anywhere on the Internet, including adding new users or even shutting down the server.

FastTrack's NSM is actually a series of JavaScript applications with frames to make it easier to navigate through the various options. Button bars in the top frame let you choose the area to administer, such as Restrict Access or Reports. NSM will also work with the forthcoming set of SuiteSpot servers, including the Enterprise Server and the Catalog, Mail, News, and Proxy servers.

The use of a browser as an administrative interface demonstrates how far Java and other browser-application languages still have to go when compared with the ease of use of drop-down menus and dialog boxes. For example, when we wanted to delete a user from a group with NSM, we had to remember the user's name and enter it manually rather than select it from a list. The final version of NSM may fix this shortcoming.

In a similar vein, NSM and IIS use a Windows NT program called Internet Service Manager (ISM) to oversee and control server functions. ISM offers similar unified management. The applications window tells you which Web, Gopher, and FTP servers are running. Right-clicking brings up a menu that allows you to start, stop, or pause the server or to view the server Properties. In the Properties view, you can define user access and directory-mapping abilities and set logging options.

AN EYE ON THE WEB

For monitoring, IIS includes the basic controls for logging server activity. The administration utility logs each hit and records the amount of data transferred and the TCP/IP address. IIS lets you send the report output to a SQL Server database table, and an included utility converts this data from the default Professional Internet Service log format to the NCSA Common Log File format. You can also use the utility to conduct a reverse DNS lookup to replace IP addresses with domain names.

FastTrack has the advantage of working in the Common Log File format from the start. In addition to the basic data, the report generator can give you such useful management information as application status and user log-ons.

The two servers also differ widely in terms of page-creation tools. FastTrack includes Netscape Navigator Gold 2.0, an HTML authoring tool for creating, editing, and publishing HTML documents without fussing with HTML code. Microsoft has taken a different tack, keeping IIS separate from authoring software.

Navigator Gold includes an HTML editor complete with tools for choosing colors, graphics, line styles, and type styles. Entire Web pages can be imported and used as templates for building subsequent pages. Navigator Gold supports Java and JavaScript, while none of Microsoft's authoring tools yet support either Java or JavaScript.

Netscape also provides a collection of page-creation wizards and templates for FastTrack, available from the company's Web site. These wizards prompt you for the page graphics, style, and text. Templates provide you with predesigned pages that you can modify. These components will be incorporated into Netscape LiveWire, which is scheduled to ship at the same time as FastTrack. LiveWire, which also includes ODBC (Open Database Connectivity) drivers and improved site management tools, can be purchased with FastTrack for $495.

Microsoft offers three options for HTML authoring, neither of which is included with IIS: the downloadable Internet Assistant for Word for Windows; the $149 FrontPage 1.0, which Microsoft recently purchased from Vermeer Technologies; and the forthcoming industrial-strength Internet Studio. (For more information, see "The Browser Battle Between Microsoft and Netscape" on page 40.)

FastTrack supports CGI scripts and Netscape's own CGI alternative, called NSAPI. For those who prefer working with Visual Basic, FastTrack also works with WinCGI for communicating between Visual Basic apps and the server. IIS also supports CGI scripts and Perl, and it includes support for Microsoft's Internet Server API (ISAPI).

Most Web servers use ODBC to link Web sites with databases. LiveWire uses ODBC for SQL Server, but opts for native drivers for Illustra, Informix, Oracle, and Sybase databases. For IIS, Microsoft's Internet Database Connector (IDC) has ODBC drivers for accessing SQL Server, Microsoft Access, Informix, Oracle, Sybase, and other databases.

PRICE AND COST

Head-to-head comparisons are hard to make. Though FastTrack has the advantage in terms of operating-system support, security, and the ability to run several servers on one physical system, IIS has the lead in terms of integration with Windows NT and an unbeatable up-front price. For those already running a Windows NT shop, IIS is a logical, thrifty choice.

For others who haven't standardized on Windows NT and don't have a lot of time to fiddle around with Web servers and HTML tags, FastTrack is an attractive alternative to IIS. At $495, the LiveWire package is an even better value for those who need an HTML editing package as well.

Netscape FastTrack Server. List price: $295; with LiveWire, $495. Requires: 16MB RAM, 20MB hard disk space, Microsoft Windows NT or Unix. Netscape Communications Corp., Mountain View, CA; http://home.netscape.com. *(Indian partners Microland, Bangalore; Wipro, Bangalore.)*

Microsoft Internet Information Server Version 1.0. List price: Free; FrontPage, $149. Requires: 16MB RAM (CD-ROM version, $99), 5MB hard disk space, Microsoft Windows NT. Microsoft Corp., Redmond, WA; http://www .microsoft.com. *(Indian subsidiary Microsoft India, New Delhi; Indian partners Datapro Infoworld, Pune; Godrej Trading, Bombay; Sonata, Bangalore; TUL, Bombay.)*

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NAVIGATOR PLUG-INS

Get Plugged In: Navigator Plug-Ins That Liven Up the Web



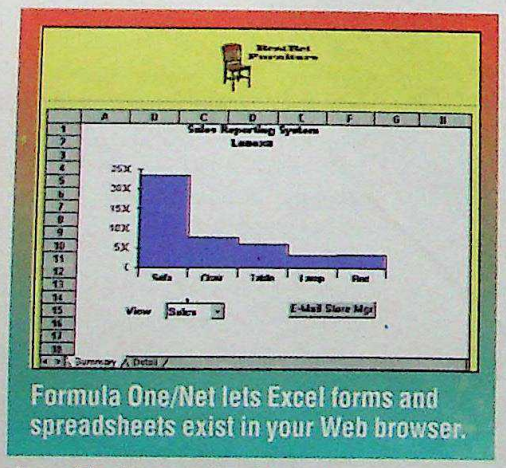
By John Morris and Sebastian Rupley

As Microsoft ramps up its Internet strategy to compete with Netscape for ownership of tomorrow's interactive Web, Netscape Navigator plug-ins are here today. These applets come in an array of shapes and sizes and have managed to infuse the Internet with a new level of interactivity.

We've uncovered many glitzy, ambitious, and useful newcomers to the Navigator plug-in party. All of them turn the concept of a static Web on its head.

You'll find applications (most of which install themselves) that have surprising capabilities to extend the Web, from translation software that automatically converts your English Web page to a foreign tongue—or vice versa—to a conferencing application to a universal video player to an Excel-compatible spreadsheet. Other plug-ins add sound or animation.

The common denominator of these Navigator plug-ins is that they bring us closer to the next phase in the evolution of Web content: interactive sites that are overflowing with multimedia.



Formula One/Net lets Excel forms and spreadsheets exist in your Web browser.

COOLTALK

Insoft's CoolTalk (*http://ice.insoft.com/*) is a near-real-time audio- and data-collaboration tool for the Web. CoolTalk provides full-duplex audioconferencing, a Web first, so that two users can speak and be heard at once.

Some of the interesting aspects of CoolTalk are an answering-machine feature for recording audio and a mute button for when, say, your dog is barking in the background. The product's freehand drawing tools are useful but require a digitizing tablet to work well; the magnification tools are excellent for enlarging regions of a document.

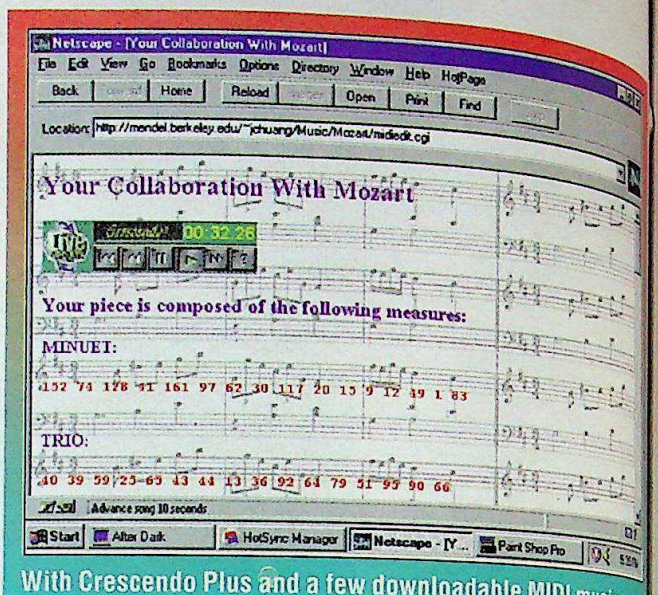
Despite its full-duplex capabilities, we found that—as with most teleconferencing systems—CoolTalk worked best if one user spoke at a time. Audio was often choppy, but CoolTalk proved to be an adequate Internet-based competitor to standalone whiteboard/conferencing packages. We found that CoolTalk worked best over a 28.8-Kbps modem.

At $49.95 (or $69.95 for two copies), CoolTalk makes the connection at a much lower price than that of most other teleconferencing programs.—*SR*

CRESCENDO PLUS

LiveUpdate, a division of Labtech, is aiming to inject a little audio into the Web with its MIDI plug-in, Crescendo Plus. Available for $19.95 from the company's Web site (*http://www.liveupdate.com*), Crescendo Plus is a viable alternative to Progressive Networks' RealAudio; a light version, Crescendo, is available as a free download.

Compared with RealAudio, Crescendo technology requires no special server software and bypasses proprietary compression in favor of MIDI. A 1-minute MIDI file is typically 10K to 20K, while even short .WAV files can take up megabytes.



With Crescendo Plus and a few downloadable MIDI music files, you can make Web pages sing.

Like RealAudio, Crescendo Plus utilizes streaming so you don't have to wait for the entire file to download before it can start playing. To get a taste of Crescendo, try visiting LiveUpdate's Cool Site of the Day section, MIDI Central (*http://www.tstmedhat.com/~neburton*) or MIDI Classics (*http://www.midi-classics.com*).

When you get to a site that uses Crescendo background sound, the music automatically begins playing and the Crescendo Plus control panel pops up. The control panel has a timer and buttons to play, stop, fast forward, or rewind the MIDI track.

Crescendo Plus costs less than Xing's StreamWorks and is more compact than RealAudio, and its player module is more flexible than The DSP Group's Editors' Choice–winning TrueSpeech Internet. Crescendo Plus also has the advantage of working with MIDI files, not some exotic compression technology.—*JM*

FORMULA ONE/NET

Visual Components' Formula One/Net (*http://www.isualcomp.com/f1net/download.htm*) is a plug-in that lets you embed Excel-compatible spreadsheet applications within Navigator and could usher in an era of interactive Internet-based spreadsheet applications.

A great way to share data w... out having to rely on a C... script, Formula One/Net is fu... compatible with Excel ... spreadsheets and can be linked ... an ODBC database. Visual Co... ponents' home page includes s... eral examples of Web-based i... teractive spreadsheets and for... that can be viewed and edited d... rectly within Navigator.

During testing, we fou... Formula One/Net was surpri... ingly fast at intensive tasks su... as big recalculations, although ... we didn't find it as snappy ... Excel at working with charts o... a standalone PC.

If you're seeking a way to fe... spreadsheet data to a Web brow... er or create an interactive for... look no further than Formu... One/Net.—*SR*

NET TOOB

Duplexx Software's Net To... Multimedia Pager is a one-s... solution for viewing video or a... mation, from .AVI, .MOV, ...MPG video files to .FLC a... .FLI animation files.

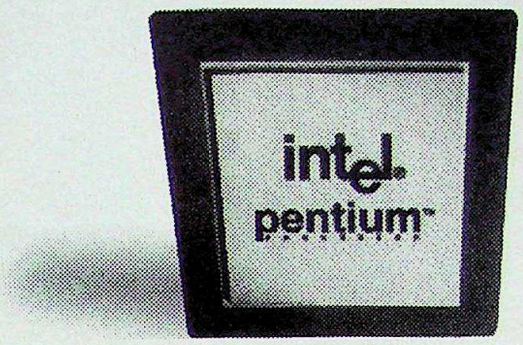
Rather than requiring you ... download video files and vi... them externally, Net Toob au... matically plays them from wi... your browser. It has a simple, ... tuitive VCR-like interface, a...

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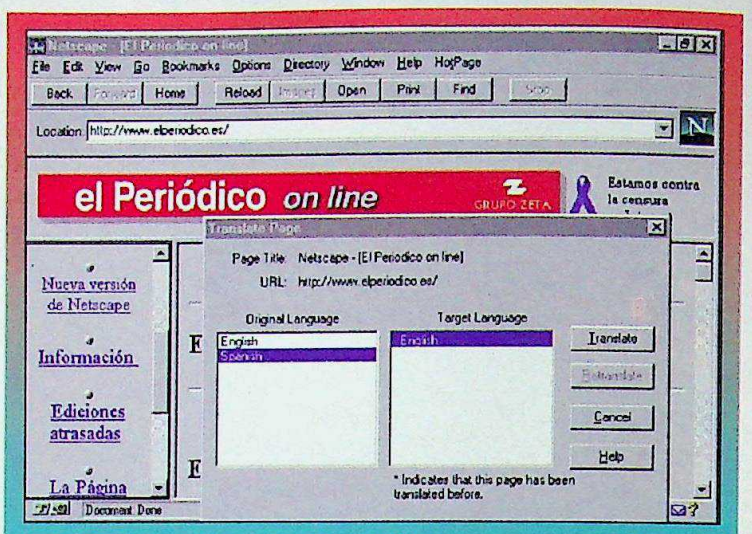
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matically sets up within Navigator, and handles audio well.

We played several .MPG files at 7.5, 15, and 30 frames per second and observed little image degradation, even at the fastest frame rate. Running Net Toob at one-eighth-screen size produced better video quality than one-quarter-screen or full-screen. As with other video plug-ins, Net Toob has a fuzzy look at full-screen size.

We were quite impressed with Net Toob's all-around abilities. A demonstration version, which remains active for two weeks before requiring registration and payment, is downloadable at *http://www.duplexx.com*. The $14.95 cost of Net Toob is a small price to pay for the convenience that it provides.—*SR*



With Web Translator, select which languages you want to translate Web pages from and to, and voilà!

QUICKSILVER

QuickSilver is a plug-in that allows you to use Micrografx Designer to create and display vector-based Web graphics. QuickSilver, which can be downloaded free from Micrografx's Web site (*http://www.micrografx.com*), lets you go beyond viewing to transform just about any graphics image into an interactive online object.

QuickSilver lets you open and view vector files, which the program calls Objects, that have been created in a variety of formats: Micrografx Designer's .DSF and CorelDraw's .DRW and .DS4. To work with and manipulate these Objects, you must also have the $299.95 ABC Graphics Suite 95.

By comparison, Corel Corp.'s CMX Viewer (*http://www.corel.com/corelcmx*) and Electronic Book Technologies' FIGleaf Inline (*http://www.ct.ebt.com/figinline*) both support viewing of vector graphics, but QuickSilver also allows you to turn graphics into interactive objects without fussing with HTML coding.

QuickSilver works by having you select an illustration in one of the supported formats, click on the Object menu item, and select Properties. In the Properties dialog box, you can assign a URL for the Web object to jump to or have the object perform several other Web tricks.

In addition to letting you view vector illustrations on the Web, QuickSilver can also inject a level of interactivity by transforming them into live objects.—*JM*

SIZZLER

Totally Hip's Sizzler is an anim... tion package that can add s... crackle, and pop to your W... pages. Sizzler allows you to vi... animated sprites from within y... Web browser.

Sizzler is a plug-in for viewi... Sizzler sprites; there's also the S... zler Editor, which has controls f... cell-by-cell editing. The edi... which is currently an alpha pro... uct, will eventually include file co... verters for .AVI and .FLI forma... according to Totally Hip (*http... www.totallyhip.com*), so you do... have to start from scratch.

The plug-in is based on Obje... Scenario technology, which s... stream applications at low da... transfer rates without taxing sy... tem memory or using a lot of ha... disk space. Sizzler sprites are i... terlaced so that images appear ... full animation almost immedia... ly and gradually become sharp... as the download proceeds.

We were able to open spri... files in the Sizzler Editor and vie... their components in the editor... Explorer-like Tree View windo... We also adjusted the sprit...

Continues on page ...

Three of a Kind: Plug-Ins, ActiveX, and Java

Say good-bye to dull, static pages, because the Web is all about interactivity. Say hello to immersive Web worlds that are alive with information. Although Netscape had the early lead in enabling interactivity—with the Navigator Plug-In architecture and support for Sun's Java—Microsoft is coming up fast with its own take on the interactive Web.

The Navigator plug-ins we evaluated work by displaying and allowing you to interact with MIME (multipurpose Internet mail extension) data. Having ignored Navigator plug-ins to this point, Microsoft now says that it will support this architecture soon.

Microsoft's Web vision involves ActiveX, a mix of old and new. ActiveX controls are basically OLE custom controls (.OCXs) with a few new interfaces that support Internet-related functions.

ActiveX relies on the existing OLE programming infrastructure, which provides two routes to an interactive Internet. One is to use an OLE Document Object, or DocObject, as a generic container. For example, Internet Explorer could evolve into a DocObject container and then add Excel (which can function as a DocObject server), and voilà—your Web browser is now capable of creating, viewing, and editing Excel spreadsheets natively.

ActiveX controls can also function as servers. Microsoft's unreleased DCOM (Distributed Common Object Model) standard, for example, will allow client and server controls to communicate with each other and distribute the workload across multiple networked systems. Microsoft's preproduction development environment, Visual C++ 4.1, includes new frameworks and AppWizard support for building Internet-server applications using Microsoft's ISAPI.

ActiveX also permits scripting, so that Web pages have controls whose behavior is automated from within the browser; ActiveX controls can even interact with each other. In addition, VBScript—a subset of Microsoft's programming language, Visual Basic—will be available as an ActiveX Scripting interface; eventually, we expect ActiveX Scripting implementations of Perl and JavaScript.

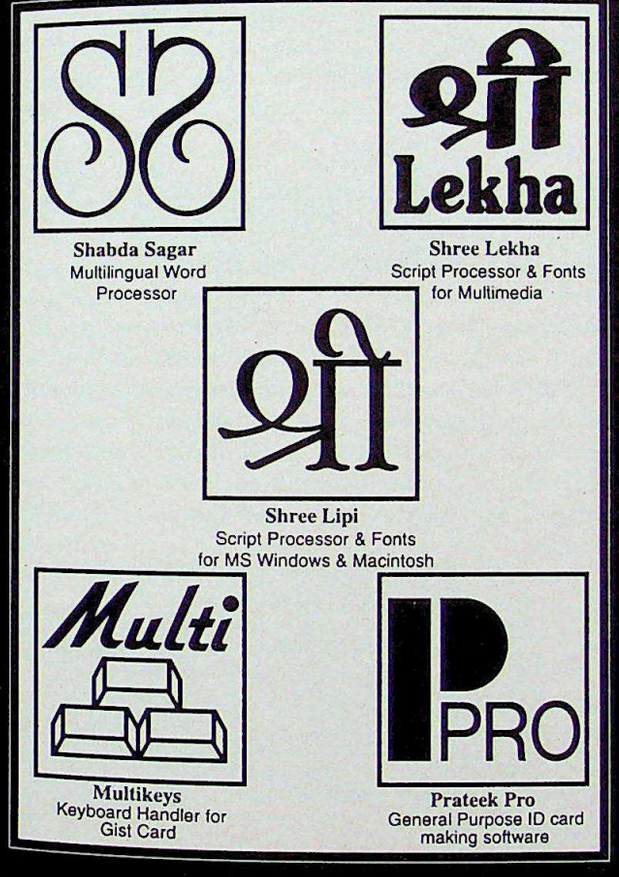
Java, perhaps more than any other technology, is associated with Web interactivity. An object-oriented programming language descended from C++, Java has been used to enable give and take between client and server, such as stock and sports tickers and interactive product finders. Navigator already directly supports Java, and Microsoft says its products will work with Java by using a wrapper that makes Java code look like an ActiveX control.

Web developers have no shortage of ways to turn the Internet into a two-way street.—*John Clyman and Larry Seltzer*

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Shree Lipi : Shree Lipi is an Indian Language script processor under MS Windows, with a collection of fonts and utilities compatible with both **IBM PC and Macintosh**. The ultimate in desktop publishing, it supports the largest collection of Indian typefaces in all Indian scripts and has a variety of keyboard layouts.

Shabda Sagar : Shabda Sagar is a DOS based **multilingual word processor** with commands that are similar to Word Star. User friendly to the core, it supports a majority of printers in use. Another attractive option is the availability of a variety of keyboard layouts.

Shree Lekha : Shree Lekha is a DOS based Indian language script processor available with **fonts for multimedia** video graphics. Its diverse features support various applications including Autodesk Animator & 3D Studio etc.

Prateek Pro : A software package for preparing General Purpose Identity cards in Indian Languages, its applications can include Labels, Tags etc also. The package includes a simple data base editor, along with an image grabbing module, flexible layout designing & printing module for use in both B/W & colour photographs as well as text.

Multikeys : Multikeys is a DOS based keyboard layout handler for Indian Languages to be used with GIST cards. It allows the use of popular keyboard layouts like Modular, Godrej, Ramington etc. Also available is a program for generating user defined layouts.

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speed and position, and the editor's Mouse Control menu allowed us to turn the sprite into a dynamic link to other URLs.

Like Macromedia's popular Shockwave, Sizzler works with bitmapped images, but Shockwave has its roots in full-fledged multimedia authoring. Sizzler won't replace these hard-core tools, but the package does make it easy to design animated Web pages that'll keep surfers coming back for more.—*JM*

WEB TRANSLATOR

Like the United Nations, the Web is truly a Tower of Babble. Enter Globalink's Web Translator, an Internet-based translator.

At the click of a button, Web Translator can exchange the text on the active page in your Navigator browser from French, German, or Spanish to English, or vice versa. The full Web Translator costs $49.95, but a version that can translate up to 500 words is downloadable from the company's Web site (*http://www.globalink.com*).

To perform a translation, you open the page you want to read in the Navigator window and then launch Web Translator; unfortunately, you can't open the program from within the browser's window.

Next, click on the Translate button and choose which languages to translate from and to. If you previously translated the page, you can click on Retranslate to update it.

On our tests, it took roughly 1 minute to translate a typical Web page from Spanish to English. This *draft translation* was generally understandable and correct but occasionally produced humorous results: "public service to the Internet. . .arrived to Merida much before what you was imagining." The program was smart enough to transpose nouns and their modifiers, so "Unión Europea" correctly became "European Union." When Web Translator comes across a difficult word, the program wisely either gives the possible options or leaves the word untranslated.

For anyone who's ever wanted to read the headlines from Quito or to learn more about Le Tour de France, Web Translator is a powerful but simple interpreter.—*JM*

WORLDVIEW

Intervista Software's WorldView is a 3-D Web browser for entering and interacting with virtual-reality worlds. Available as a plug-in at the company's Web site (*http://www.intervista.com*), this program has been incorporated into Microsoft's rendering technology, Reality Lab 3D, so it has a good chance of becoming the VRML standard.

You can enter and move around any virtual-reality world with WorldView by using a combination of mouse and toolbar controls. There are buttons for panning, tilting, going to, inspecting, straightening up, and restoring a view. If you hit an HTML link while using WorldView, your chosen browser will pop up alongside the WorldView window.

WorldView, like most virtual-reality browsing technologies, thrives on computing power: Intervista recommends at least a 486DX/50 PC and a 14.4-Kbps modem, but we suggest at least a Pentium system with a 28.8-Kbps modem. WorldView lets you trade image quality for speed. For example, the Good option produces flat shading, which produces rougher shading than the Best option; the Poor option displays wireframe models. The loss in image quality is made up for with increased performance.

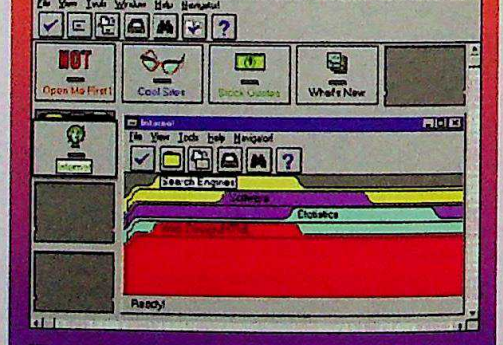
Competition among VR[illegible] browsers is running hot. Virtus offers an extremely rich set of [illegible] that you can view with its brow[illegible] at *http://www.virtus.com*, but [illegible] biggest competition for We[illegible] View will likely come from M[illegible] crosoft's Virtual Explo[illegible] (*http://www.windows.micro[illegible] .com/windows/vrml.html*) and Netscape's WebFX brow[illegible] (*http://www.paperinc.com/web[illegible] .html*), which Netscape recently [illegible] quired from Paper Software.

Keep in mind that these N[illegible] gator plug-ins are just the st[illegible] Expect to see further integra[illegible] of databases, multimedia, [illegible] 3-D as the Web is fully tra[illegible] formed from a passive to an [illegible] tive viewing medium.

Making Sense of the Web

Document management is firmly entrenched on the desktop but is only starting to have an impact on the Web. Two new products—Iconovex's AnchorPage and DocuMagix's HotPage—that can work alongside Navigator or by themselves show the possibilities.

Iconovex's AnchorPage (*http://www .iconovex.com*), a free download, is targeted at Web users who need to find or create documents relevant to specific interests on the Web but retain the ability to drill-down to desired data within the documents. AnchorPage analyzes a Web-server's database at the rate of about 300 words per minute to create a plain-English indexed synopsis.



Keep your favorite Web pages and URL links in HotPage's file cabinet.

For an example of the potential of this approach, go to Iconovex's Web site (*http://www.iconovex.com/anchor/ demos/telcom.htm*) and view a linked version of the recently passed telecommunications bill. Conceptually, this technique is just as valid for working with a corporate intranet consisting of a plethora of legal and technical documents or a government site that includes the legislative and courtroom histories of various laws.

By contrast, DocuMagix's $79 HotPage is an organizational tool that is based on the electronic file cabinet from the company's document management software, PaperMaster. You can arrange the cabinet's drawers in any order, create new drawers, and select titles, icons, and text color for each drawer. Within each drawer, you can create a series of color-coded folders to hold your HotPage documents.

If you find something on the Web you want to keep, HotPage gives you two choices: HotSave saves the item as an HTML document with graphics, formatting, and links preserved. Or HotPrint prints the item as a TIFF image with URL links in the upper-left-hand corner. You can also insert text anywhere on the page or attach an electronic sticky note.

Once you have the files in your HotPage file cabinet, you can attach them to other documents and print, fax, and e-mail them with any MAPI-compliant client. In addition, the ShowText function strips out a document's HTML tags, graphics, and formatting, launches your word processor, and pours the remaining text into a new document. During testing, the program worked well but had trouble dealing with frames; only the active frame was saved to disk.

HotPage's extensive Web document management can turn the Internet into your personal data source, while AnchorPage can make quick work of complex Web sites.—*JM and SR*

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ELECTRONIC COMMERCE

Digital Bucks? Stop Here

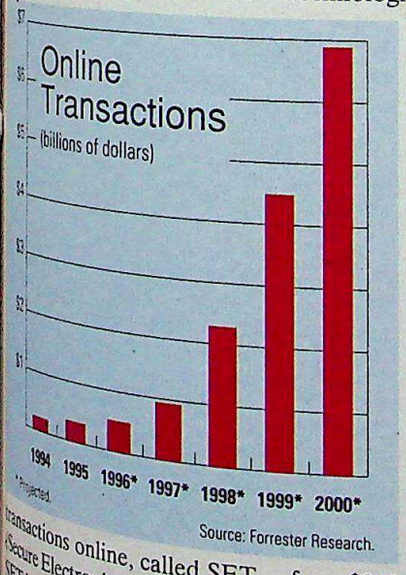


By Sebastian Rupley

As if we needed another way to spend our money. Until recently, commerce on the Web had been more of a rumor than a reality, but now buyers are reaching for their online wallets. A recent survey of Internet users showed that just 7 percent had ever purchased a product online. But some big names are joining forces to change that.

Buying and selling products online is nothing new. Major commercial services such as America Online, CompuServe, and Prodigy have allowed customers to purchase a wide variety of goods online for years.

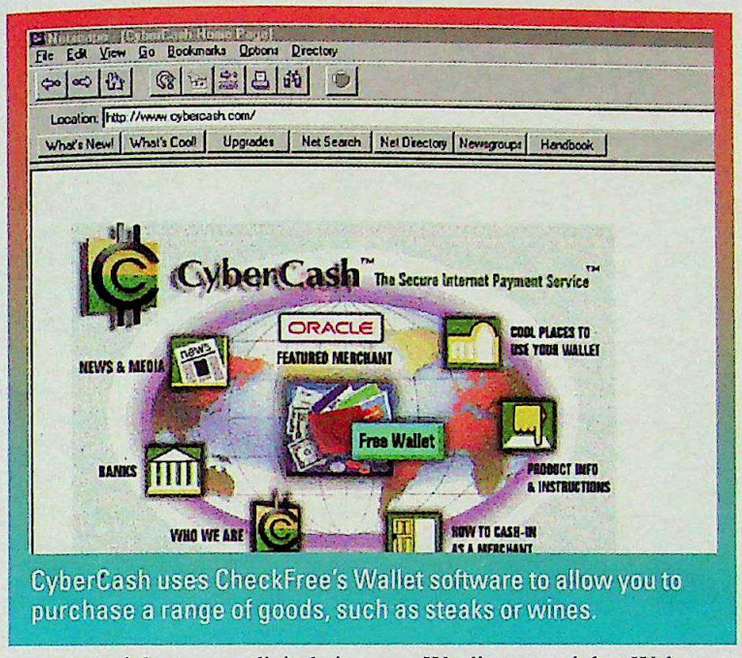
To date, the biggest impediment to Web commerce has been the potential risk of sending your credit card number or other transaction data over an inherently unsecure network. A cadre of powerful companies—IBM, Microsoft, MasterCard, and Visa—are backing a new standard for protecting credit card transactions online, called SET (Secure Electronic Transactions). SET is based on public-key cryptography and electronic certificates issued by credit card companies, which consumers send to merchants to authorize transactions. In addition, Microsoft has announced that a new digital-signature technology that automatically authenticates Internet purchases will be built into Windows.



Aside from security concerns, digital-cash start-ups have also encountered difficulties enlisting a critical mass of merchants and banks willing to support their technologies. The good news is that the infrastructure is now in place for a variety of transactions based on digital cash.

The improved security and growth of the electronic-commerce infrastructure have prompted some rosy projections. According to a recent Forrester Research study on Internet commerce, worldwide revenues from interactive online sales increased from $240 million in 1994 to $350 million last year and could reach $6.9 billion by 2000.

To see just how far Web commerce has come—and in some cases how far it still has to go—we went on a virtual shopping spree. We stopped by some cyberspace malls established by major digital-cash companies and pulled out the online plastic to see how easy it really is to buy goods on the Web with a credit card.



CyberCash uses CheckFree's Wallet software to allow you to purchase a range of goods, such as steaks or wines.

We discovered that Web commerce has come a long way.

CYBERCASH

The leading digital-cash player, CyberCash, is also expected to be the first to cash in on digital commerce. CyberCash, which is partly owned by Softbank (*PC Magazine*'s corporate parent), generates its fees from banks and merchants, not consumers.

At CyberCash (*http://www.cybercash.com*), an online spending spree begins by downloading the Wallet software, which was developed by CheckFree. Once you have a CyberCash account, start looking for Web pages of participating merchants; they display a CyberCash "buy" icon. Just select the goods for purchase, click on the icon to launch CyberCash, and click on the credit card icon. The program sends your CyberCash ID number (which you get when you register), encrypted via RSA's public-key technology, to CyberCash, which decodes it and submits it to a participating bank for authorization.

You can link directly to a variety of shopping sites from CyberCash's home page, including Driesbach's steaks and Virtual Vineyards' California wines. CyberCash provides a streamlined way to spend that makes it almost too easy to buy online.

DIGICASH

Want to add a little international flavor to your online shopping trip? Amsterdam-based DigiCash (*http://www.digicash.com*) is a launching pad to a whole slew of imported online wares.

Unlike CyberCash, DigiCash's ecash isn't a substitute for a credit card at the transaction level. Instead, ecash uses its own virtual currency, represented by on-screen coins and issued by partner banks. The banks are responsible for certifying the authenticity of ecash's virtual coins.

To load your PC with ecash coins, you establish an account with one of the participating banks. The ecash is stored locally on your PC and transferred to the merchant using public-key encryption.

DigiCash's list of participating cybershops is eclectic and at times downright eccentric. Two oddball ways to spend digital cash are the Virtual Beggar, which accepts ecash handouts with a promise to put them to "no good use" (*http://www.gehlken.com/beggar/index.html*) and Instant Gratification Travel (*http://shrine.cyber.ad.jp/~repka/IGTA.html*), which provides slide-show tours of Tokyo for $3.

You won't find many durable goods for sale via DigiCash, but fascinating intellectual property and unusual doodads abound.

FIRST VIRTUAL

First Virtual has built a Web shopping scheme around e-mail that bypasses credit card security altogether. The company also offers one of the widest selections of Web-based stores (*http://www.firstvirtual.com*).

The first step is to establish a First Virtual account and get a VirtualPIN ID. This costs $2 and will require the use of a MasterCard or Visa account. After the initial charge, no fees are charged to the buyer other than the cost of the products.

To buy an item with First

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Virtual, you give your VirtualPIN ID to the merchant, which then forwards this and transaction information to First Virtual's payment server. First Virtual then sends e-mail to you requesting approval. Upon approval, your credit card is automatically billed.



Cybertown offers one of the largest selections online but lacks advanced security features.

Participating shopping sites are plentiful, and First Virtual's site provides links to them. First Virtual's participating merchants (*http://www.infohaus.com*) are a blend of durable-goods sellers, such as Miracle Boost Jeans, and intellectual-property sellers that offer goods such as a pamphlet entitled "50 Idiot-Proof Ways To Make Money On The Net." You can even buy a car at the site.

First Virtual provides a workable hybrid between pure credit card transactions and digital cash.

CHECKFREE

CheckFree's Wallet software, which you can download at *http://www.checkfree.com*, is a standalone application designed to integrate with Web browsers. The software is included with the Spyglass Mosaic browser and is likely to be used in more Internet payment systems.

CheckFree charges the user a monthly service fee of $5.95 for the first 20 payments and $2.95 for each payment after that. The first time you use CheckFree's Wallet application, you enter a checking account or credit card number and a password. This information is stored in a dual-key RSA-encrypted file on your PC.

The payment data is used to make purchases with participating Web merchants. The merchant then forwards the encrypted information to CheckFree for authentication. CheckFree is responsible for billing either the checking account or the credit card account.



eShop Plaza's graphical interface delivers an enjoyable and visual online shopping experience.

Those wary of electronic card transactions will find CheckFree's service a safe alternative. CheckFree avoids the problem of encryption and trafficking in proprietary digital currency, but it also provides added security over direct online credit card transactions.

We found several interesting sites that use CheckFree's Wallet (*http://www.mc2-csr.com/v.../checkfree/v20/wmalls.html*), including Media Mart (for CD-ROMs and videos) and Team Sports Wear (for logo-emblazoned T-shirts and sweat suits).

ESHOP PLAZA

eShop Plaza has blossomed into a shining example of the virtual mall (*http://www.eShop.com*). In addition to the original tenants (Go...

Continues on page...

Five Virtual Record Stores

While some people have been waiting for airtight security before they'll buy anything on the Web, the rest of us have been out shopping.

Today on the Web, you can purchase things such as books, flowers, PCs, and music. Lots of music. A recent Yahoo! search turned up no fewer than 277 sites that sell some form of music. The rewards of a Web musical excursion include the ability to search by album title or song title, or even by lyrics. At many sites, you can also sample the music.

Each of these five sites offers secure servers for transmitting confidential data, such as your credit card number, and a variety of search services to find the music you're looking for.

FIREFLY

Firefly *(http://www.ffly.com)* is an innovative site that uses artificial-intelligence technology to analyze your taste in music.

The site's music-ranking system recommends future purchases based on your past selections and on a profile you provide. It's fun to play with and amazingly accurate at guessing what you'll like. It also has the unusual ability to suggest selections that are in stock.

CDNOW

CDnow *(http://www.cdnow.com)* was one of the first music sites on the Web and continues to be one of the most complete and the one that contains the deepest cross-linking.

You can search on an artist and review the resulting list of recordings by date, by title, or by rating. You can read CD reviews as well as a brief biography of the artist. Delivery can be slower than with Firefly, but there are a range of shipping options.

1-800 MUSIC NOW

Though not in the same league as CDnow and Firefly, 1-800 Music Now *(http://www.1-800musicnow.mci.com)* has the best virtual listening rooms. They're easy to navigate, and you can quickly find the right tunes to download. The site also uses cutting-edge technology, such as ShockWave, to enhance your shopping experience.

MUSIC BOULEVARD

Music Boulevard *(http://www.musicblvd.com)* has a wide selection of music and also includes a variety of music publications you can access directly. For example, it's great to read a review of the music in *Spin*, listen to a selection, and then be able to buy the CD. In addition, there are links to e-zines such as @Country, Blues Review, Dirty Linen, e.Bop, Fanfare, Puncture, and more.

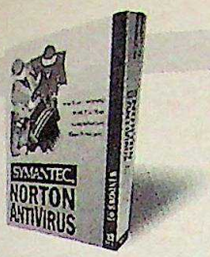
CDWORLD

CDworld *(http://www.cdworld.com)* features one of the best and fastest search engines among music sites on the Web. Though it bills itself as the biggest discount-music store and its prices are competitive (though not bargains), the selection isn't as astounding.

Your choice in music is as personal as where you choose to shop for it. Of these five sites, Firefly is the most fun and CDnow has the best selection, but all are worth a peek—and a listen.—*Rick Ayre*

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Microsoft Network
Delphi
GEnie
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Guys Electronics, Insight Direct, 1-800-Flowers, and Tower Records) you'll find some unexpected extras, such as Felissimo's "exquisite gifts from New York" and Spiegel, the catalog standard.

There are no separate eShop transaction fees, because the mall makes its money from sales commissions. From eShop's home page, you can download free shopping software. The mall and its shops are rich with graphics, right down to a street teeming with virtual shoppers.

The eShop interface goes beyond the static forms-based fare you'll find at most other sites. For example, at Tower Records, there are rows and bins that closely resemble the ones in a real record store.

eShop's mall allows you to purchase and send gifts directly to someone by entering the recipient's address. The mall's shops are big on discounts for first-time users. We saved $2 on a CD at Tower Records, and Spiegel offers 20 percent off your first purchase.

We found eShop's graphically advanced software made online shopping more enticing.

CYBERTOWN

Cybertown is more than just a shopping mall. You'll find food, downloadable software, virtual-reality tours, and much more (*http://www.cybertown.com*).

In addition to the usual merchandise, some offbeat wares you'll find at Cybertown's mall include animal-art sculptures, BMW auto accessories, and boat designs. Cybertown gets its fees from store owners in exchange for allowing them to set up links to its cyberspace mall.

Unlike other electronic-commerce methods, Cybertown does not require a dedicated shopping program. Instead, you establish a Cybertown ATM account. The ATM account affords you "credits" good for a 10 percent discount at Cybertown stores. You can also choose to buy directly from merchants using encrypted credit card transactions, but you only receive the discount if you use your Cybertown account.

The shopping's easy and the mall is packed with merchandise, but you won't find eShop's gifts, the high-tech security at some of the more advanced digital-cash sites. Direct credit card transactions through merchants are the order of the day here.

Cybertown offers one of the best selections available anywhere on the Web. It's a nice way to shop.

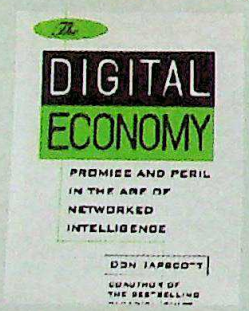
All the Web's a Wallet—Or Soon Will Be

By Sebastian Rupley

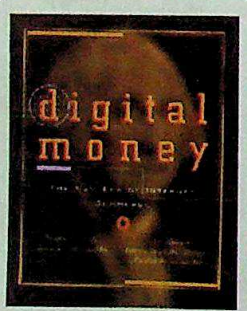
With the era of online commerce upon us, the rush is on to implement workable strategies for secure monetary transactions in cyberspace.

These books, which range in scope from exhaustive technical overview to technology snapshot to historical survey, set out to explain how digital cash works and to cover complicated issues, including security, encryption, economic impacts, standards, and the subtle differences among the players.

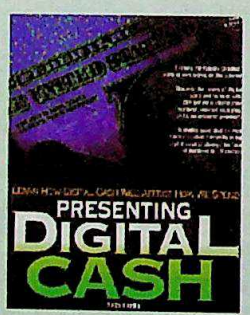
From May 13 to 17, you can visit *http://www.zdnet.com/pcmag/discuss.htm* to discuss the theory and practice of digital commerce with the authors.



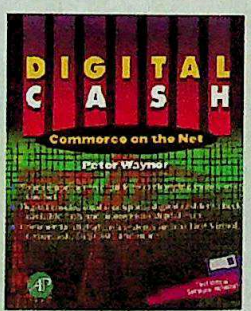
● *The Digital Economy* ($24.95), by Don Tapscott (coauthor of *Paradigm Shift*), is not intended as an introduction to the technical issues but as a survey of the effect high technology has had on society. In this book, Tapscott does an excellent job of contrasting hide-bound socioeconomic norms with emerging techno-norms. This provocative treatise will please students of the history of technology just as much as it will digital-cash theorists. *http://www.mcgraw-hill.com.*



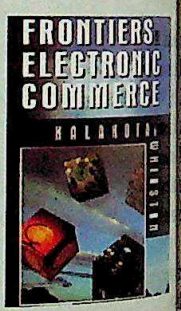
● *Digital Money, The New Era of Internet Commerce* ($24.95), by Daniel C. Lynch (founder of CyberCash) and Leslie Lundquist, shines in some parts but is not useful for those seeking practical advice. For example, Lynch and Lundquist delve into how democracy and politics may be affected by Internet commerce, but they are short on specifics, lack focus at times, and include incomplete discussions of the primary digital-commerce providers. *http://www.wiley.com.*



● Seth Godin's 250-page *Presenting Digital Cash* ($25) is the most accessible and lucid of the current crop of books on digital cash. Godin has organized the book into sections on technology and on digital-cash providers. The case studies on implementing digital cash and encryption schemes are as interesting as they are telling about the difficulties involved. If you only read one book on digital cash, this should be it. *http://www.mcp.com.*



● If you're planning to set up a commercial Web site, Peter Wayner's *Digital Cash, Commerce on the Net* ($34.95) is a must-read. It provides a guide focusing on making the most of First Virtual's technology.
The included 3.5-inch floppy disk is filled with many of the back-end tools you'll need to get started.
This book is a treasure trove for anyone who wants to use First Virtual technology to sell on the Web.
http://www.book.uci.edu.



● *Frontiers of Electronic Commerce* ($49.50), by Ravi Kalakota and Andrew B. Whinston, is a heavily researched analysis of global electronic commerce, from electronic cash to networked databases to firewalls.
The authors provide not only one of the most in-depth discussions of intelligent software-commerce agents available; they also look at virtual-reality environments for electronic commerce and at Internet advertising strategies. *http://www.aw.com.*

NOVICE EXPERT

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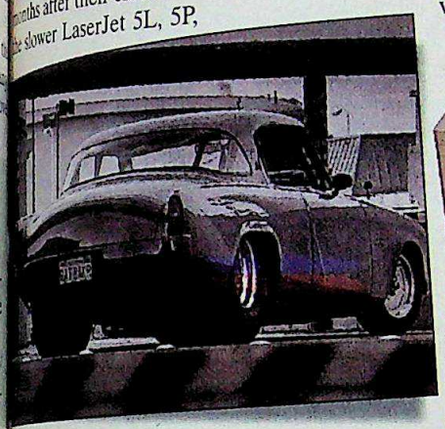
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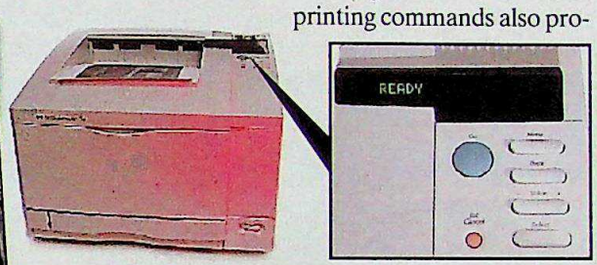
NETWORKED PRINTERS

HP's LaserJet 5: The Leader in Desktop Laser Printers Evolves

By Edward Mendelson

Hewlett-Packard's new HP LaserJet 5 series—the 12-page-per-minute (ppm), 600-dot-per-inch desktop printers that replace the LaserJet 4 Plus series—arrive on the market many months after their close cousins: the slower LaserJet 5L, 5P, and 5MP and the high-speed LaserJet 5Si (First Looks, March 15, 1996). Like their predecessors, these new LaserJets are more evolutionary than revolutionary, but they remain the best printers you can buy in their class.





LITTLE THINGS: *The HP LaserJet 5M builds on the success of the 4 Plus series and adds important updates, such as a new control panel and rocker switches (inset). Thanks to the use of PCL 6, the HP LaserJet 5M produces complex graphics faster and more accurately.*

You can choose from three members of the latest branch of the LaserJet 5 family. The $1,299 LaserJet 5 comes with 4MB of RAM, while the $1,799 LaserJet 5M adds an extra 2MB of RAM, Adobe PostScript Level 2 support, and a network card for EtherNet and LocalTalk. In between is the $1,549 LaserJet 5N (for *network*), a basic 4MB LaserJet 5 that adds Ethernet support but lacks the LaserJet 5M's PostScript and LocalTalk support. Each of these printers has four SIMM slots for memory expansion; the LaserJet 5 and 5N can hold up to 66MB. The LaserJet 5M's memory capacity is limited to 52MB because of the presence of the PostScript module.

These new printers have a sleeker exterior than earlier models, and there's a button that cleans and quickly cancels the current print job. Otherwise, the hardware is essentially the same as that of the LaserJet 4 Plus series. The main internal difference is the replacement of the 4 Plus's 25-MHz RISC processor with a 33-MHz chip. The processing speed for complex graphics will increase, but there won't be much practical effect on printing text.

Infrared support for wireless printing isn't built in as it is in the LaserJet 5P, but it can be added through an optional sensor that plugs into the back of the printer. Fonts, forms, signatures, and similar material can be stored on optional flash-memory SIMMs, but you'll have to wait for a new generation of forms and word processing software to take full advantage of this feature.

On the page, the main advance is support for printing a minimum of 256 shades of gray. Below the surface, the major innovation is HP's new printer control language, PCL 6. PCL 6 speeds graphics printing by introducing new imaging "primitives." You can generate a box with rounded corners, for example, with two or three commands instead of about a hundred. This sixth generation of laser-printing commands also provides a closer match between the position of fonts on-screen and on the page (see the sidebar "PCL 6 Produces Graphics Faster").

On PC Labs' tests, the LaserJet 5M came close to its rated output speed, producing 11.2 text pages per minute in both PCL and PostScript mode. Although graphics were impressive, there were some barely noticeable light or dark patches in the output of some bitmapped images—to be expected from this class of printers.

A pair of Windows drivers and a set of DOS drivers come with the printer. Both Windows drivers use the lucid interface familiar from earlier models in the LaserJet 5 series. There's also a Windows driver that provides PCL 5 support, which lets the new printer emulate earlier models.

A separate, "enhanced" Windows driver provides PCL 6 support to produce faster graphics and improved screen- and page-matching. Be careful, because the enhanced driver may produce slightly different output compared with that of the basic driver. HP says that the enhanced output is a more accurate representation of what's on the screen.

The enhanced driver doesn't support the Windows 95 Enhanced Metafile (.EMF) format, which is used by most other PCL drivers to enhance spooling efficiency. But HP claims that PCL 6 is so efficient that it doesn't need .EMF support. OS/2 and Windows NT drivers are available from HP's online forums.

The LaserJet 5, 5M, and 5N all have the same 17.4- by 16-inch footprint as the LaserJet 4 Plus

Continues on page 32

PCL 6 Produces Graphics Faster

The latest version of HP's printer control language, PCL 6, is a major step forward in streamlining graphics. It includes three major advances, some of which won't be widely used until new generations of hardware—such as scanners and fax machines—support the new language.

- PCL 6 information streams are device-independent packages of data that can be sent to and from computers, printers, and fax machines. They can consist of anything from a signature or a clip-art image to a whole set of documents. Streams can be stored on flash SIMMs in the LaserJet 5 for faster printing, in the same way that macros can be stored on SIMMs or cartridges under earlier versions of PCL.
- PCL 6 includes an extensive toolbox of graphic objects and operators, including paths, Bezier curves, pens, bitmaps, clipped paths, and rotations and a variety of other transformations. These allow complex images to be generated on the page with compact code instead of the large, simple methods used in earlier versions, bringing PCL closer to the capabilities of PostScript. For example, it takes more than a kilobyte of complex data in PCL 5 to produce a rounded rectangle, while PCL 6 can produce the same object with 19 bytes of code.
- PCL 6 supports the use of a compact synthetic font technology—instead of traditional bitmaps or outlines—to send complex font data with the highest possible efficiency.

Right now, only the latest LaserJet 5 printers support all these features, but you can expect more extensive support across the rest of HP's product line soon.—*EM*

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HP LaserJet 5M

Continued from page 31

printer, but their 11.8-inch height is slightly shorter compared with the earlier model. Although we like the idea of adding carrying handles to this behemoth of a printer, the sculpted handholds are awkward and at times painful to use, since the LaserJet 5M's 37-pound weight rests entirely on your fingertips.

The printer's main paper tray holds 250 letter- or legal-size sheets; the fold-down front tray holds an additional 100 sheets or 12 envelopes. An optional 500-sheet lower tray costs $299 and fits under the printer. A $679 L-shaped duplexer unit adds a few inches below and behind the printer itself.

NET POSITIVE RESULT

The LaserJet 5M's 16-character LCD screen provides more informative messages than earlier models; the control panel now uses intuitive rocker switches instead of push buttons. A switch for canceling print orders comes in handy, although there's a way for administrators to deactivate the switch so that coworkers won't be able to cancel your print jobs.

Network administrators will appreciate HP's sleek new JetDirect software. They should keep in mind, however, that its queuing algorithm prints all NetWare print jobs before it lets Windows NT jobs get a place in line. The hardware in the LaserJet 5 has proved so reliable that HP now rates it at a duty cycle of 35,000 pages per month—up from 20,000 pages for the 4 Plus.

With assured compatibility with all existing software, the LaserJet 5M is the printer of choice for desktops and small networks.

HP LaserJet 5M. Estimated street price: With 6MB RAM, Adobe PostScript Level 2, $1,799. Requires: PC parallel port, LocalTalk, or Ethernet connection. Hewlett-Packard Co., Direct Marketing Organization, Santa Clara, CA.

(Indian subsidiary Hewlett-Packard India, New Delhi; Indian parteners CMS, Bombay; Godrej Trading, Bombay; ECIL, Hyderabad; HCL-HP, Noida; L&T, Bombay.)

PC CARDS

Megahertz AllPoints Makes The Wireless Connection

By Bruce Brown

Do you need e-mail, data, and fax communication regardless of how far you are from a phone line? Based on the RAM Mobile Data Network, the $499 Megahertz AllPoints Wireless PC Card may be just the tool you need to stay in touch on the road.

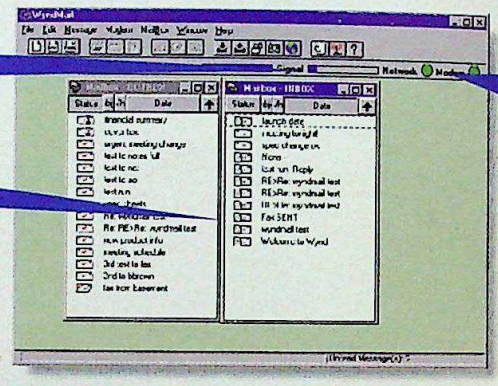
The AllPoints hardware consists of a Type II PC Card that bulges slightly from your notebook to allow room for the card's 9-volt battery and 5-inch retractable and removable antenna. Each card comes with a unique Mobitex number, a 9-volt alkaline battery, and a rechargeable nickel cadmium battery that lasts for 30 hours per charge.

Software for the AllPoints card is available for Windows 3.1, Windows 95, and Macintosh platforms, as well as for a variety of PDAs, such as HP's OmniGo, 100LX, and 200LX and the Apple Newton. The card also comes with Wynd Communications Corp.'s WyndMail and RadioMail, wireless-service providers with individual gateways for one- and two-way communications. Research in Motion's RAD-I/O, a DOS program for transferring files and developing custom communications applications, is also included.

The WyndMail interface is functional and well designed. There are prominent bar graphs for signal strength and battery charge and a pair of connection lights that indicate whether or not you're connected.

During our testing, we found that the system could connect to the radio network with a signal strength as low as 10 percent. With even a minimal signal, the card worked from a moving train and from a variety of stationary locations.

Repeated efforts to use the card underground, from a basement office to a subway, were not successful. But with good connections and using Wynd's gateway, the AllPoints card successfully sent and received e-mail, using Internet addresses, faxes, pages, and text-to-voice messages.



ON-RAMP: *WyndMail's interface makes getting connected with AllPoints easy.*

In many respects, AllPoints is similar to DTS's ZAP-It. For one, you don't need a computer to get your messages. WyndMail's server uses sophisticated text-to-voice technology to read plain-text messages over the phone. For another, you can't use the PC Card modem to connect to a phone line's RJ-11 connector, so you'll need to carry an extra modem to use land lines.



REACH OUT: *AllPoints lets you use the RAM Mobile Data Network to send and receive messages wirelessly.*

Over a wide variety of operating conditions, we experienced transmission speeds of up to 8,000 bits per second, making AllPoints more appropriate for hit-and-run e-mail communications than for sending long documents, graphics, or multimedia.

When you reach a destination within range of the RAM Mobile Data Network, you simply turn on the computer and start the software. AllPoints automatically does the rest. If the signal is strong enough, AllPoints connects to the network, receives incoming messages, and sends those you've stored for transmission.

There are several service levels available, starting with a $2[illegible] basic monthly service that includes 200 messages of 150 characters each. Additional messages cost 5 cents per unit, and wireless faxes and text-to-voice messages cost 39 cents each. There's also a service that can store frequently sent faxes on Wynd's server for forwarding to numbers that you specify. We found this was a convenient way to distribute forms, price lists, and other commonly used documents.

In the past, wireless communications seemed to be equal parts cutting-edge technology and magic. Today, however, the Megahertz AllPoints Wireless PC Card is an everyday tool for keeping in touch with your office, wherever you are.

Megahertz AllPoints Wireless Card. List price: $499. Requires 4MB RAM, 1MB hard disk space, Type II PC Card slot, DOS 6.0 or later, OS/2 2.11, Windows 3.1 or later or Windows 95. U.S. Robotics Mobile Communications Corp., Salt Lake City, UT; http://www.megahertz.com

(Indian partner Microsense Computers, 808 Embassy Center, Nariman Point, Bombay 400 021. Tel:2872948, Fax:2[illegible])

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STANDBY SERVER

eal-Time Server Mirroring Solution for Windows NT

Vinca Corporation, a leading supplier of business continuation products, has announced StandbyServer for NT, which is being touted as the first real-time server mirroring solution for Microsoft's Windows NT Server.

StandbyServer for NT is a real-time, transaction-based software that mirrors data simultaneously to a standby machine via a dedicated industry standard link. When the main server fails, due to any hardware or software failure, the product can automatically switch operations to the standby machine. Users experience a momentary delay, but they do not need to reestablish their network connection. Since there is an up-to-the-moment copy of all data on the standby machine, users have access to all their data even when the main server fails. Switch-over parameters are user -definable and can be customized to meet the needs of all organizations. StandbyServer for NT takes advantage of Windows NT's built-in system management capabilities to provide features such as remote error logging and remote monitoring.

With the introduction and shipment of StandbyServer for NT, organizations using more than one network operating system across the enterprise can standardize on one fault-tolerant solution. StandbyServer for NT supports Intel EtherExpress PRO/100 and IBM's 100/10 PCI Ethernet adapter with support for other network interface cards to follow in the near future. This product also uses standard network cabling as the dedicated link between the main server and the standby machine. In the near future, support for fiber cabling will be added to allow the standby machine to be located on another floor or in another building to provide disaster recovery.

The primary server and the secondary server do not need to be identical. Customers can extend the life of older hardware and preserve their initial investment. Moreover, StandbyServer for NT operates as a simple device driver. It does not require any modifications to the network operating system.

Vinca Corporation is the creator of storage access networking (SAN) architecture for computer networks. It specializes in fault tolerance, backup, and disaster recovery solutions.

StandbyServer for NT. *Vinca Corporation, 1815 So. State Street, Orem, Utah 84058. Tel 2233100; Fax: 2233107.*

INTRANET PUBLISHING SUITE

inging Internet Resources to the Private Corporate Network

S-based Novell has announced a corporate intranet publishing suite. Called ell InnerWeb Publisher, it is signed to bring the power of World Wide Web (WWW) users' existing corporate networks. The suite includes a web rver, a web browser, a web-ge authoring tool, an IPX-to- translator, and the NetWare runtime operating system.

The publishing solution gives ers everything they need to their internal networks into rporate intranets.

Intranets, or corporate inter- networks, enhanced with rnet technologies and secured inst external access, are ex- ted to grow much faster than Internet. Zona Research, a ket-research firm in Red- od City, California, predicts the installed intranet base surpass the Internet base year, as will shipments of rporate intranet products. The further predicts that spend- on servers for corporate rnet applications will grow m $1.63 billion this year to $ 3 billion in 1998.

The central element of erWeb Publisher is Novell's ly released NetWare Web ver 2.5, a NetWare loadable dule (NLM) that lets customers utilize NetWare servers as the core of their full-fledged web sites. Users can install and configure the software quickly and easily on an existing NetWare 4.1 server, without having to learn new languages or protocols.

NetWare Web Server 2.5 is the only web server that allows users to browse Novell Directory Services (NDS) to locate critical information on network users and resources. The product features Java applet support and gives developers a choice of three interfaces. Additionally, NetWare Web Server 2.5 supports fault tolerance and leverages the security features inherent in NetWare and in TCP/IP. The NetWare Web Server comes with a license for one server, which supports an unlimited number of users.

In addition to the NetWare Web Server, Novell InnerWeb Publisher includes Netscape Navigator 2.01, SoftQuad's HoTMetaL Light, Quarterdeck's IWare Lite, and NetWare 4.1 Runtime.

Netscape Navigator 2.1 supports the latest Internet technology including Java, JavaScript and inline plug-ins. Additionally, the product features as integrated e-mail and news reader, and supports HTML (HyperText Markup Language) and a bookmark facility. Netscape Navigator comes with a licence for 50 users, but may be upgraded for additional users.

HoTMetaL Light is an HTML authoring tool that combines high-powered templates and forms tools with traditional wordprocessing features for the creation of web pages. HoTMetaL Light comes with a multi-user license that allows up to five people to use the product simultaneously.

IWare Lite enables web access over IPX (Internet packet exchange), so that users do not have to install TCP/IP stacks on every desktop to connect to their corporate intranets. Only one IP address (on the server) is required. IWare Lite comes with a license for one server, which supports an unlimited number of users.

NetWare 4.1 runtime is the core NetWare 4.1 operating system. It gives customers a cost-effective way to implement the NetWare Web Server on a dedicated runtime server in either a NetWare 3.x or NetWare 4.x environment. The NetWare runtime license is for one server and two users (for normal file and print access over the network). The two-user runtime license does not restrict the number of users accessing the NetWare Web Server on the runtime platform.

InnerWeb Publisher converts users' networks into a powerful platform for publishing HTML pages. It provides users all the benefits of internal web publishing while preserving their investment in hardware, software, and training.

Novell is represented in India by Bombay-based Onward Novell Software India, a joint venture between Onward Technologies and Novell.

Novell InnerWeb Publisher. *Onward Novell Software India, Marwah Bhavan, Saki Vihar Road, Bombay 400072. Tel: 8351995; Fax: 8214203.*

Corrigendum

In the cover story *UPS/CVT: The Struggle for Power* in May 1996 issue of *PCMI*, we had given the *PCMI* estimate of Elnova and Elent turnovers during 1995-96 from sale of UPS/CVTs (page 144). These figures are incorrect. The correct figures are as follows: For Elnova, the gross sale was Rs 114 million as against Rs 78.4 million in 1994-95. For Elent, the sale was Rs 78.34 million, as against Rs 61.17 million in 1994-95.

The errors are regretted.

—The Editor

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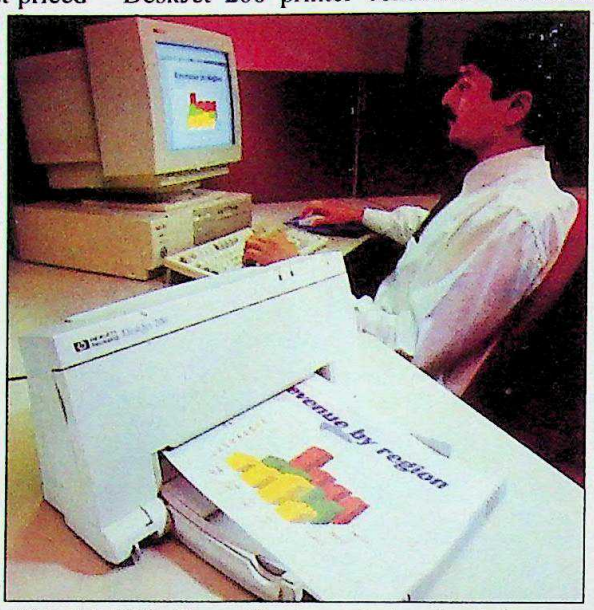
INKJET PRINTER

Low-Priced Printer for SOHO Segment

Hewlett-Packard company has introduced its lowest priced personal printer ever, the HP DeskJet 200. Priced at Rs 10,900, the DeskJet 200 printer provides low-cost black printing on plain paper with its new, low-cost black ink cartridge (Rs 901 list price) and special ink-saving mode. The printer offers consumers HP's print quality and reliability for the same price as a dot matrix printer.

The new printer is designed for first-time printer buyers, office users, and home users who will use the printer primarily for personal use.

The introduction of the DeskJet 200 printer continues HP's drive to further extend its leadership in the expanding inkjet printer market. The printer uses HP's exclusive Resolution Enhancement technology (REt) for crisp text and smooth edges. It is ideal for correspondence, reports, budgets, and other documents.



HP DeskJet 200: *Cost-effective solution for light use.*

An optional color kit converts the printer for color printing, when needed. The color kit, with a list price of Rs 3,700, includes a color print cartridge that snaps into place. HP's ColorSmart technology makes color printing automatic, in much the same way autofocus cameras simplify 35 mm photography.

DeskJet 200 is both compact and easy to use. In addition to PCL support for DOS printing, it offers a simple and complete Windows printing solution, HP's PrintSmart for Windows. It provides benefits such as fast [illegible] to application, fast printing, advanced features such as reverse printing and multiple-page printing. DeskJet 200 is [illegible] dows 3.1 and Windows 95 and-play-compatible. The can fit the printer into almost space in the office or home.

The printer includes a page paper tray for auto- feeding, while a manual feed provides expanded versatility labels, post cards, standard- envelopes, and additional paper sizes for different print project.

DeskJet 200 comes with one-year warranty. Like all DeskJet printers, the new pr uses approximately 80% energy than typical dot-m printers.

HP DeskJet 200. *Hewlett-Packard India, Paharpur Business Center, 21 Nehru Place, New Delhi 110019. Tel: 6472311; Fax: 6461117.*

VIDEOCONFERENCING SYSTEM

Intel Upgrades ProShare Video System 200

Intel has announced the world's first PC-based multipoint video, audio, and data conferencing solution that is fully compliant with international telecommunications standards. The new upgrade to the Intel ProShare Video System 200 allows up to 24 people to simultaneously participate in a video conference from their individual desktop PCs.

Intel ProShare Personal Conferencing is a PC-based video conferencing system that offers full application and document sharing. It gives users powerful information sharing capabilities to exchange ideas with other users.

The Intel ProShare Video system includes a sleek desktop video camera which sits atop the monitor and helps project a strong visual presence of the user. At the heart of every Intel ProShare system is a powerful software tool, the Intel ProShare Personal Conferencing software, allowing colleagues to share, discuss and mark documents—spreadsheets, sales reports, and graphs—in the ProShare system notebook. Users can simultaneously view and make changes within the originating application. It uses familiar PC commands and tools—pointing with the mouse, writing with a pen, emphasizing with a highlighter, typing comments on a keyboard, and so on. It works with any Windows application and includes on-screen multi-page notebook, document import and snapshot, markup tools, Jump Start, Shared OLE, and Save and Print capabilities.

Intel ProShare Video System 200 is a full-featured desktop system that connects users over an ISDN phone line or LAN and takes advantage of all document and application sharing capabilities. It can also share video and voice with other H.320-compliant room systems, other desktop conferencing systems, and multi-point control units.

Intel ProShare Video System 150 allows all the powerful features of the ProShare Personal Conferencing software over the existing LAN/WAN infrastructure. It is ideal for corporate networks and internetworks where ISDN telephone lines are not yet available.

Intel's ProShare Video System 200 delivers multi-point video, audio and data conferencing through compliance with international standards, including the T.120 standard for sharing data with multiple conference participants, and the H.320 standard for multi-point video and audio conferences. ProShare systems communicate with other brands of video, data, and audio conferencing solutions that comply with these international standards. All ProShare systems run on Windows 95 and Windows 3.1 operating systems.

In addition to multi-point video conferencing functions, Intel's ProShare Video System 200 includes enhanced conferencing features and a new screen display. Intel's ProShare Video System 200 also includes improved audio/video quality through new video compression and decompression algorithms. It is supported by leading multi-point conferencing services, as those available from AT&T, MCI, Sprint, Deutches Telekom, France Telecom, and NTT.

ProShare users can also purchase their own multi-point control units to conduct multi-point video, audio, and data conferences. The ProShare Video System is fully supported by leading multipoint control unit suppliers, such as VideoServer, Inc. Lucent Technologies. Several computer platform and software suppliers have announced plans to integrate ProShare technology into their product offerings. Some of these PC vendors include Compaq and Lotus. Compaq will announce that the CompaqPro systems are specially configured with Intel's ProShare systems, while Lotus Real-Time Notes will also have ProShare multi-point functionality. Intel has also enhanced its ProShare Video System 150 and ProShare Premier software to enable multi-point data conferencing over corporate intranets.

Intel ProShare Personal Conferencing System. *Asia Electronics, 4/2 Sampige Road, Plaza, St. Marks Road, Bangalore 560001. Tel: 2275065, 2275067.*

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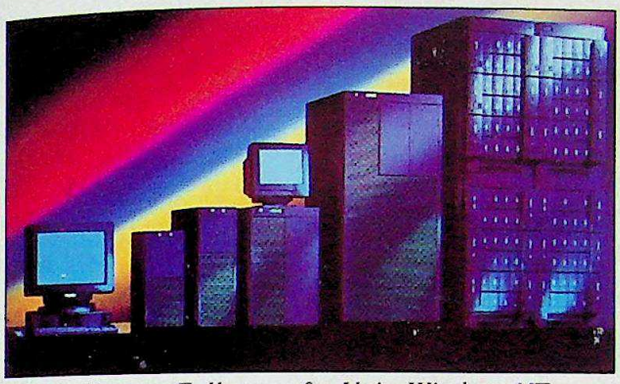
VIDEOCONFERENCING SYSTEM

Siemens Nixdorf Launches Server Range for Unix and Windows NT

Bombay-based Siemens Nixdorf Information Systems has launched the new C Series of the RM family of servers for the Unix and Windows NT market segments. Features highlights of this three-series—RM400 departmental server, RM300 compact server, and RM200 desktop server—are extended SMP (symmetrical multiprocessing) technology, an innovative I/O bus architecture (PCI), and easily increased RAM and hard disk capacities.

Cluster capability as well as security and high availability functions, particularly important in business-critical applications, have also been considerably enhanced.

The RM400 C Series is being launched as a further development of the successful RM400 Tower Series. The new quad-processor SMP architecture of the RM400 C Series, based on the 64-bit RISC Mips R4400 processors, now supports up to 400 active users. The new 64-bit high-performance system bus, used in conjunction with the PCI bus, also considerably boosts system performance.



C Series Servers: *Full range for Unix, Windows NT.*

The new server category RM300 targets the distinct market for low-end servers. The innovative plug-and-play SMP architecture supports trouble-free transition from the monoprocessor models to the top dual-processor model—without a change of operating system. This enables the RM300 C Series to offer a far higher level of expansion capability. The RM300 C Series implements the new high-performance PCI I/O bus with powerful I/O controllers for disk sub-systems and network connection.

The RM200 C Series is a development of the successful RM200 RISC desktop systems. The innovative PCI bus architecture delivers improved graphics performance and expansion capability. As a result of its scalable graphics modules, the RM200 system is particularly well suited to handle high-resolution applications including true-color, 2D, 3D, multimedia, video processing, and also supports simultaneous operation with two high-resolution 22" monitors.

The C Series will be marketed in India through Siemens Nixdorf direct sales as well as through independent software vendors (ISVs) and value-added resellers (VARs).

RM400, RM300, RM200 C Series. *Siemens Nixdorf Information Systems, 130 Pandurang Budhkar Marg, Mumbai 400018. Tel: 4962551; Fax: 4930259.*

SUPERCOMPUTER

Cray Announces Enhancements to Its Parallel Vector Supercomputer Lines

Cray Research has announced significant field upgradable enhancements to its market-leading Cray T90 and Cray J90 parallel vector super-computer lines. Official claim that the company it plans additional enhancements in the future. The Cray T90 series enhancements include a faster memory system that delivers three-and-a-half times the bandwidth of current Cray T90 system memory. The new memory, called CMO3, is expected to improve Cray T90 total system speed by up to 40%. The new memory offering will significantly aid in speeding memory-intensive workloads, where problems with huge amounts of data associated with them, such as weather and climate modeling, and large-scale auto engineering and other industrial problems.

Additional Cray T90 system enhancements include a new processor option for IEEE floating point compliance. The IEEE option improves the Cray T90 system's compatibility with data on workstations and other systems, as well as its ability to support the many third-party applications that have been ported to IEEE-compatible systems. Customers can mix and match Cray floating-point processors and IEEE floating-point processors in one system to tailor their solution.

Cray T90 is the leading supercomputing system in the high-performance computing industry. The enhancements are intended to further strengthen Cray's hold on the supercomputing market.

Cray also announced that both the Cray T90 and J90 systems now support Cray's scalable input/output (I/O) and networking technology, GigaRing, first launched with the Cray T3E scalable parallel system last November. Cray's intent with the GigaRing technology was to design a flexible, cost-effective I/O system common for all Cray supercomputers.

The GigaRing has virtually unlimited capacity to store and move data into and out of systems such as the Cray T90 supercomputer at the industry's fastest speed of up to 38.4 gigabytes/second. The GigaRing can support up to quadrillions of bytes (petabytes) of disk capacity. For the Cray J90 super-computer, the flexible GigaRing I/O and networking technology makes it easier to build super-clusters (clusters of super-computers). Because the Giga-Ring is scalable and customers only buy what they need, those who plan to have multiple Cray systems on their network have a flexible, shared I/O system.

Cray J90 system enhancement highlights include the J90se, a new faster processor which doubles the scalar speed of the Cray J90 system and improves overall system performance on vector-scalar codes up to 40%. Customers can also mix and match the new processor modules with current Cray J90 modules, upgrading all or portions of their Cray J90 system.

Cray J90 is Cray's air-cooled, low-cost vector supercomputer priced from $ 500,000 onwards. The Cray T90 system is Cray's high-end system proceed from $ 2.5 million onwards. Cray Research is a subsidiary of Silicon Graphics, and provides leading supercomputing tools and services to help solve customers' most challenging problems.

Silicon Graphics has also announced the combined Silicon Graphics/Cray Graphics product strategy and roadmap, with evolutionary product unification culminating in a single scalable architecture and software environment by the year 2000. Cray's parallel vector products remain the workhorses for important classes of existing and emerging applications in the automotive, aerospace, chemical, government, pharmaceutical, and weather/environment industries.

Cray T90, Cray J90. *Silicon Graphics Systems, A30 Kailash Colony, New Delhi 110048. Tel: 6211345-55; Fax: 6472217.*

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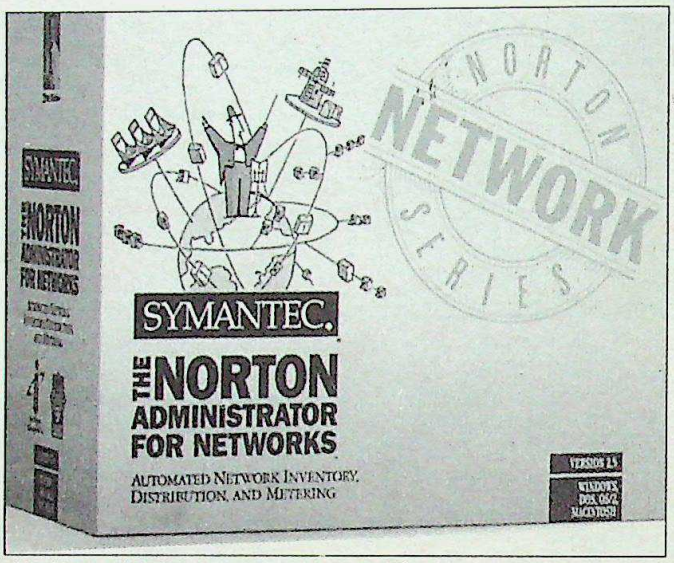
NETWORK UTILITY

Symantec Launches Norton Administrator for Networks 2.5

US-based Symantec Corporation has announced the latest version of Norton Administrator for Networks (NAN), a software program that provides a LAN to WAN scalable solution for hardware/software inventory, software distribution, and software license metering across heterogeneous desktop and LAN environments. NAN 2.5 extends the management reach of the program through native IP and DMI support, and continues the program's commitment to heterogeneity with support for Windows 95 and Windows NT.

NAN 2.5 provides native IP support through a Winsock-compliant TCP/IP stack that establishes a connection between domains, and transfers files between parent and child sites. Users don't need to maintain NAN login accounts on each server or use drive mapping to establish links.

Through support of the Desktop Management Interface (DMI), NAN 2.5 extends the scope and accuracy of the inventory capabilities of the product. Customers can use the inventory agent of NAN 2.5 to collect available information, such as attached printers and modems, from a PC's management information file. NAN also creates a new inventory category that provides information on DMI including DMI version, status, and description.



The Norton Administrator for Networks: *Ideal program for inventory, software distribution, and software license metering.*

NAN 2.5 also includes software metering enhancements under Windows 95. It includes a 32-bit license metering agent for metering of 32-bit and 16-bit Windows applications running Windows 95.

The distribution module of NAN 2.5 allows the addition, deletion, and modification of registry keys. The registry can be edited locally or remotely, using a distribution job rather than a script. Network administrators can also restrict distributions to a particular platform such as Windows 95 or Windows NT. Users can also implement the distribution module to create program groups or icons.

NAN 2.5 is compatible with the major network operating systems including Novell NetWare, Banyan Vines, MS LAN Manager, MS NT Advanced Server, DEC Pathworks, and IBM LAN Server, and supports DOS, Windows, Mac, and OS/2 client operating systems. NAN 2.5 is a key component of Symantec's Norton Network series, which includes Norton Desktop Administrator, Norton AntiVirus, Norton AntiVirus for NetWare, Norton pcAnywhere, Norton Disklock Administrator, and Norton Utilities Administrator.

Norton products are distributed in India by Svam Software, Sonata Software, and Infotech Technologies.

Norton Administrator for Networks 2.5. *Infosys Technologies, Pavitra Complex No 1, Cross 27th Main, BTM La, Ist Stage, Bangalore 560; Tel: 6681755; Fax: 668014*

GATEWAY

Range of Hardware, Software Solutions for Internet/Intranet Connectivity

Cisco Systems has announced new solutions that provide NetWare users with secure connections to the Internet and other TCP/IP (Transmission Control Protocol/Internet Protocol)-based networks. The Cisco IPeXchange 1000 Series of Internet gateways combines hardware and software to provide IPX-to-IP gateway functionality along with remote network connectivity.

Three IPeXchange Internet gateway models will be available. These are IPeXchange 1003, 1004, and 1005. All the products include Cisco IPeXchange software, based on Cisco IOS and Cisco 1000 Series hardware. The products will also incorporate ClickStart, Cisco's powerful World Wide Web-based software configuration and set-up tool.

By using IPX protocols on the remote LAN and a single IP address for the entire Novell network, network managers will no longer need to configure and maintain a TCP/IP stack on every desktop computer. This also creates a firewall between the internal NetWare network and the public network, preventing intruders from accessing critical information on any desktop or NetWare server. With the IPeXchange Internet gateways, connecting a NetWare network to the Internet is now a quick, simple, and inexpensive process.

ClickStart is a Cisco IOS technology, and its interface guides the user through the installation process. ClickStart is interoperable with the most popular Web browser packages, including Netscape Navigator, which is bundled with the IPeXchange Internet gateways. By completing an initial set-up form using a simple point-and-click interface, a user can easily configure the gateway to operate over a wide-area network. The IPeXchange Internet gateways can be managed from a central location.

IPeXchange 1003 and IpeXchange 1004 support Ethernet-to-ISDN connectivity. IPeXchange 1003 includes an ISDN BRI port, and the IPeXchange 1004 includes an integrated NTI device. The IPeXchange 1005 supports Ethernet-to-Frame Relay or Ethernet-to-leased line connectivity. All models are available in 20-user or 50-user configurations and support Point-to-Point Protocol (PPP) compression and several other powerful features for optimizing WAN bandwidth and costs.

Cisco Systems is a leading global supplier of internetworking solutions for corporate intranets and the global Internet. Its product range includes routers, LAN and WAN ATM switches, dial-up access servers, and network management software. Cisco Systems has been operating in India since the beginning of 1995 from its liaison office in New Delhi. It sells and supports its internetworking products and services through distributors including Wipro Infotech, Microland, UB Network, Datacraft ICIM, Tata Unisys, Apcom Computers. It has a dominant market share of the internetworking business in India.

IPeXchange 1003, 1004, *Cisco Systems, Liaison Office, Suite 119, Hyatt Regency, Bhikaiji Cama Place, Ring Rd, New Delhi 110066. 6881234; Fax: 6886833*

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Feature Story

REMOTE-SITE ROUTERS

Routers in All Places

Every site in your company's reach needs a router. Think remote routers that make good use of central sites and WAN links.



By Charles Lin

As a company branches out geographically, the network administrator is charged with connecting all locations to the corporate network. Keeping the flow of information constant during such transitions helps your business maintain a competitive edge. You likely will need a router at every remote site—each one must be able to talk with the router at the central site and at all the other remote sites.

INSIDE

PC MAGAZINE

Even if you've managed to avoid routers of any kind in your network to this point, you probably cannot avoid them forever. And even if you don't have far-flung branch offices and remote users that require routers (yet), chances are you'll want to connect to some other entity at some point that requires a router. But take heart. Like other areas of networking, routers have gotten some much-needed usability attention from vendors.

WE'D NEVER SUGGEST ROUTERS are easy to use (well, okay, maybe to a true router veteran we might), but they have gotten somewhat easier. That's especially true for the remote-site routers we review in this issue. Author Chuck Lin takes us through installing and configuring remote-site routers from three major vendors.

THERE ARE MORE USER-friendly routers in First Looks. Frequent contributor Les Freed reviews Shiva's entry into the ISDN router market, the Shiva Integrator 100. We had this single-BRI-line device operating in only 10 minutes. It's got lots of great features to help save money on your connection costs. Its only drawback is the lack of an integrated NT-1, which, says Shiva, is coming in future releases.

IN ADDITION, RYAN Tabibian gives us a look at the Farallon's Netopia. This ISDN router combines good management options, helpful administrative tools, and a bundle of applications to get you up and running. Although targeted for connecting to the Internet, it also can act as a remote-site router.

FINALLY, DOES THE thought of freshly toasted NICs make your skin crawl? We thought so. Find out from PC Labs, West Coast director Steve Buehler what you can do to avoid this delicacy in Multiple Access.

—Gail Shaffer

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These branch-office—or remote-site—routers are less expensive and somewhat less complicated than their central-site counterparts. But they're still routers—with routing tables to be established and filters to be set. You'll need routing expertise to set them up and manage them—but not necessarily at the remote site.

We recommend that you purchase the remote router from the same manufacturer as your central-site router. Deployment and management will be much easier with a complementary pair. And most remote-site routers are priced surprisingly well: around $2,000 to $3,000.

After the initial hardware investment, the two long-term costs you'll face are the monthly WAN circuit charges and the expense of hiring someone to install and manage the router. You have some options, though, for keeping costs down.

We tested remote-site products from three major players in the router market. Each router is designed to work with a central-site router from the same manufacturer: Bay Networks' BayStack Access Node Hub, Cisco Systems' Cisco 2516, and 3Com's NETBuilder Remote Office 221. Each is a good choice. Our reviews concentrate on ease of deployment, WAN optimization, security, and ongoing management. Each factor can affect the cost of connecting your branch office.

3Com NETBuilder Remote Office 221

We deliver our Editors' Choice for this product set along with our observation that you'll simply run into fewer problems if you go with a remote-site router from the same manufacturer that supplied your central-site device. Each of the routers in this set is first-rate, with as much approachability as routers can have at this point. So we're comfortable recommending any of these routers—depending, of course, on the name on your central-site router.

We singled out the 3Com NETBuilder Remote Office 221 for our Editors' Choice because its solution, to a somewhat greater degree than the other two products', embodies the whole idea of remote-site routing. That is, needing a remote router doesn't necessarily mean needing a router expert to set up shop at the remote site.

The principal technology behind the 3Com strategy is Boundary Routing, a proprietary technology that creates a bridge rather than a route across the WAN link. This means you'll have less of a need for assistance at the remote site than you'll have with the very fine implementations from Cisco Systems and Bay Networks.

There certainly are trade-offs with all three products. Price, however, is less an issue than your connection requirements, WAN choices, and preferences in management interfaces.

PC MAGAZINE NETWORK EDITION EDITORS' CHOICE

SO EASY MY MANAGER COULD DO IT

Remote-site routers should deploy easily and require little or no administration at the remote site. These routers can be (so-called) plug-and-play, provided you can use the central-site device to configure and manage them remotely. Each vendor here implements plug-and-play in its own way.

Frame relay seems the best choice for the WAN connection in a plug-and-play situation. The frame-relay switch communicates with the router well enough for the router to set up the connection itself. Once the connection is up, the router can fetch its configuration from the central site. It can do the same over point-to-point using HDLC.

The Bay Networks and Cisco remote routers grab their configuration from a Bootp or TFTP server on the central-office LAN. 3Com takes a different approach with its Boundary Routing, which enables the remote router to auto-configure its WAN interface and act as a smart WAN bridge. Thus, the 3Com device does not require fetching the configuration file from a Bootp server.

The next challenge lies in getting the most out of the relatively low-bandwidth wide-area link. Broadcast packets that take up a small percentage of a 10-Mbps Ethernet can cripple a 64-Kbps frame relay or even a 128-Kbps ISDN or point-to-point link.

Understanding network protocols, services, and WAN tariffing can help you to streamline your WAN usage. A homogenous network environment using IP is a dream. Most real networks support multiple protocols and server platforms, which can clog the WAN link.

On a NetWare network, filtering out broadcasts such as Service Advertisement Protocol (SAP) packets is only the first step in reducing traffic. For ISDN subscribers, these broadcasts would otherwise prevent the line from tearing down, translating into high monthly charges.

With chatty protocols such as AppleTalk, packet spoofing will keep the WAN clear by fooling the remote clients into thinking that the central site is responding. Spoofing also allows routers to respond to NetWare client "Get nearest server" requests if the remote site does not have its own local server.

Monitoring network traffic at the packet level is sometimes the only way to discover problems. During our testing, for example, we discovered that our remote clients were unable to log on to a Windows NT server using NWlink. A Sniffer trace revealed that the remote-site router was filtering out the necessary IPX Type 20 packet. A simple configuration change solved a problem that was difficult to diagnose.

Routing information protocols (RIPs) also generate unnecessary traffic. Creating static routes and filtering out RIPs will reduce the traffic, but you must make sure that all necessary network changes are updated across your WAN.

MORE BANDWIDTH, AS IF BY MAGIC

Imagine tripling your bandwidth without paying a dime more. Compression is the magic that optimizes your network bandwidth. Vendors use various compression algorithms: Cisco and 3Com license Stac's Stacker, while Bay Networks uses a proprietary algorithm called WCP.

Compression can also vary depending on WAN type. ISDN and point-to-point circuits may require the Compression Control Protocol (CCP), a part of Point-to-Point Protocol (PPP). Both ends of the network must negotiate the compression type and dictionary size before using compression.

SECURITY, THE PERENNIAL ISSUE

For a channel that must be secure against external intruders, ISDN dial-up connections and the public switching of frame relay give administrators the jitters. With frame relay, though, a hacker needs to control a telecommunications company's switch in order to tap into your company's permanent virtual circuits (PVCs). For highly sensitive data, we recommend encryption. Circuits that use PPP can be protected by using CHAP and PAP, which are password-matching schemes.

For protecting your network against internal intruders, static routes and filters

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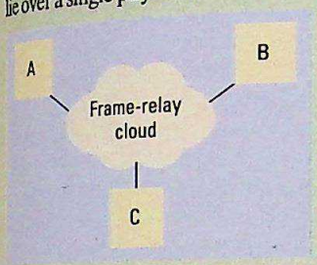
Digitized by Arya Samaj Foundation Chennai and eGangotri

Frame Wins the Relay Race

By Robert P. Lipschutz

Of the different LAN connectivity options, frame relay usually offers the best cost/benefit value proposition. Frame relay is an excellent choice for connecting distributed LAN environments, and it provides relatively low-cost digital connections for today's popular network protocols—AppleTalk, IP, and IPX.

Frame-relay networks work on the principle of statistical multiplexing, a method whereby multiple logical connections lie over a single physical connection. In practical terms, this means that a network with a single physical access circuit into the frame-relay network has access to multiple destinations. In our example, site A can talk-simultaneously with sites B and C through different logical connections called permanent virtual circuits (PVCs). This saves money, because expensive physical connections are not required between every pair of physical sites. Contrast this with a point-to-point leased line connection that only connects two designated sites.



	Benefits	Drawbacks
Frame relay	Relatively inexpensive; scales well across multiple sites	Shared network can become congested
Point-to-point leased lines	Reliable; guaranteed bandwidth	Expensive; does not scale well across multiple sites
ISDN	Digital circuit with low error rates; switched circuit	Limited availability; per-minute charges in most areas
Analog circuits (POTS)	Inexpensive	Limited bandwidth; high error rates

Typically, the physical access circuit runs at 56 Kbps to 256 Kbps, but larger and higher priced circuits are available—up to T1 speeds (1.54 Mbps).

Frame-relay providers guarantee PVCs with a certain Committed Information Rate (CIR). A provider may sell you a PVC with a 64-Kbps CIR but allow you to burst up to 128 Kbps on that circuit. When the frame-relay cloud becomes congested, however, anything above the CIR may be dropped. Most router manufacturers will use FECN and BECN (forward and backward explicit congestion notification) to notify source and destination sites about congestion in the frame-relay cloud.

can provide limited protection and should be used in conjunction with firewalls.

A WELL-BEHAVED ROUTER

Your management-tool options range from command line console debuggers to Unix-based graphical SNMP packages. All three routers we reviewed can be managed from a central location. From gathering network statistics to upgrading the remote site's firmware, administrators can do it all without leaving corporate headquarters.

All of the routers we tested offer some statistics either through the management console or via a telnet session. Information about ISDN channel uptime, compression performance, and routing tables only scratches the surface of the data available on network behavior. Enterprise networks require a powerhouse—Unix-based HP OpenView or SunNet Manager. Vendors also provide their own optional PC-based SNMP management.

WHICH WAN DO WE WANT?

Three popular WAN choices are point-to-point private lines, frame relay, and ISDN. Traditionally, large companies have used point-to-point private lines. Telephone companies can provide private lines with data rates from 56 Kbps to T1 circuits at 1.54 Mbps. The monthly bill for point-to-point lines depends on distance, circuit speed, and local tariffing. Point-to-point private lines provide a guaranteed high-speed connection. Subscribers usually use HDLC or PPP as the WAN protocol. Point-to-point also requires a dedicated interface. If you have a large number of remote sites, connecting them using point-to-point will cost more in hardware and monthly line charges.

With frame relay, PVCs are defined over the phone company's packet-switching system. You and other subscribers share the frame-relay network (or cloud). As the number of your branch offices grows, you simply purchase more PVCs; there's no need to add physical connections. The downside to frame relay is that everyone in the cloud also shares the network congestion. But frame relay has gained in popularity thanks to its low tariffing.

Integrated Services Digital Network (ISDN) is another option. But you'll need to be careful with ISDN's tricky tariffing. Much like a regular phone network, ISDN dials a phone number to establish its connection. ISDN is no bandwidth slouch: You can combine two B-channels for 128 Kbps. Depending on your provider, monthly charges can range from a flat fee to something that resembles your long-distance bill. You can use ISDN as a dial-on-demand connection, for batch transfers, or as a backup to a primary WAN link.

For starters, though, you have to understand your network and your needs completely before you can choose any of these routers or wide-area links wisely.

Bay Networks Inc.

BayStack Access Node Hub

ALL REVIEWS BY CHARLES LIN

No matter how technically experienced or inexperienced your branch office staff is, Bay Networks has a configuration method to suit your needs. We tested the 8-port BayStack Access Node Hub ($2,945) with the central-site Access Stack Node product and found both to be flexible in configuration and feature set.

Even if the remote site does not have a systems administration staff, initial installation can still be plug-and-play provided that the site is connected via frame relay or point-to-point and you use Wellfleet HDLC as the WAN protocol. Bay Network's EZInstall program configures the WAN interface, fetching the router's operating system and configuration file from a Bootp server at the central site. The OS and configuration file then can be saved onto the ANH's PC Card flash card, so future reboots can be done locally.

Bay Networks also provides Quick2Config, a Windows program that lets you configure the ANH through a serial cable attached to a workstation. Quick2Config's GUI is easy enough to use for anyone familiar with the Windows environment. With a phone call to the central-site system administrator, any member of the branch office staff can get the router on the network.

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Optimize Your Wide-Area Connection

By Charles Lin

The single biggest bottleneck in any network is the relatively low-bandwidth WAN connection. Even a high-speed T1 link, at 1.54 Mbps, offers only a fraction of what your local network's 10-Mbps Ethernet offers. If your remote sites are connected over 64-Kbps frame relay or 128-Kbps ISDN BRI, you'll really appreciate the advantages of good data compression across your WAN.

To use compression well, you should understand how it is deployed and what types are available. Here's how compression is negotiated between two routers: If the two endpoints use PPP as the WAN protocol, they first must agree on the type of compression. PPP uses the Compression Control Protocol (CCP) to negotiate the compression type, algorithm, and dictionary size. Frame relay does not use CCP to negotiate the compression, but the two endpoints still need to have identical compression settings.

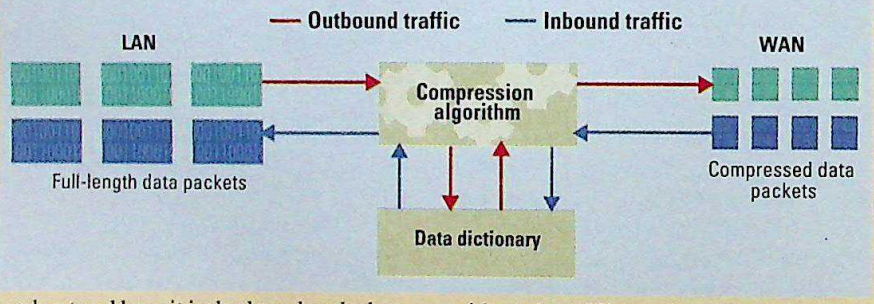
Once the negotiation is complete, it is the router's job to compress data by using a compression algorithm such as Stac's Stacker or Predictor. The router's processor power will play a part in the throughput, but the compression algorithm will determine the compression ratio. A fast processor may be able to give you a high throughput, but it's the algorithm that determines the bandwidth savings.

Compression also can be divided into packet-based and history-based. Packet-based compression uses a proprietary dictionary to replace patterns in the data portion of the packet with a token. A larger dictionary provides better overall compression. When the packet reaches the other endpoint, the router checks the dictionary and replaces the token with the equivalent uncompressed data.

History-based compression uses a managed dynamic dictionary. Any unfamiliar data portion is kept in the dictionary of both routers. When a duplicate packet is routed through the WAN, the dictionary replaces the packet with a token. History-based compression will dramatically reduce the amount of bandwidth wasted by broadcast packets.

How Compression Makes Better Use of Bandw

Compression can multiply your WAN's bandwidth significantly. Before a packet is sent to the WAN circuit, a compression algorithm uses a data dictionary to replace the data packet with a new smaller data packet. In order to use compression, both ends of the WAN must agree on the compression algorithm, dictionary type, and dictionary size.



PACKET FILTERS AND SPOOFING

In a large network environment of multiple servers and protocols, service broadcasts such as SAPs, watchdog packets, and even NetWare serialization packets can add up. On 10-Mbps Ethernet LANs, the problem isn't noticeable. But when these packets are forwarded through a 64-Kbps frame-relay link, excess traffic can translate into money wasted.

When a packet enters the router's Ethernet interface, the router reads the packet's subnet address, which tells the router whether the packet belongs in the local network. If it is the same subnet as the Ethernet interface, the packet is dropped. Otherwise the subnet is checked against the routing table and forwarded to the correct interface.

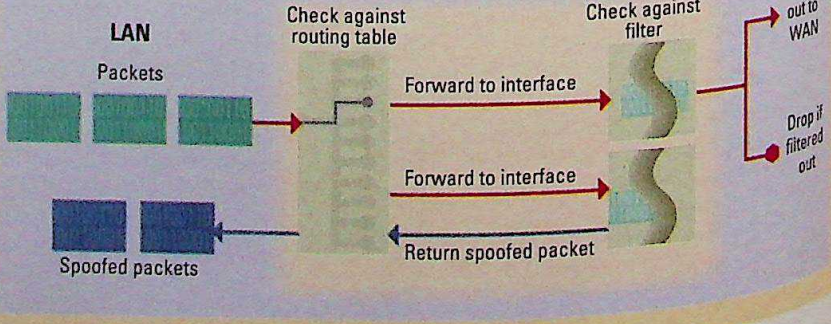
Once the correct route is determined, the packet is forwarded to the interface. In the case of a broadcast packet, the packet is distributed to every remote interface. Outbound filters at each interface intercept the packet and either drop it or spoof a response.

Filters also can be used to prevent network clients from detecting services. For example, by using filters the administrator can make servers invisible to selected subnets, thereby protecting sensitive data from curious users.

Implementing filters without careful planning can sometimes create havoc on your network. Filtering out broadcast packets or spoofing requests can block out changes in the network. If a server on your central network goes down, the remote stations still detect the server but are not able to gain access. An imprecise filter also might prevent your remote clients from seeing new services on the central network.

Filters and Spoofing

When a packet is routed from the local network interface (usually the Ethernet port of the router) to the WAN interface, a filter defined at the interface determines whether to forward, drop, or spoof a return packet. Preventing extraneous packets from wasting the WAN bandwith can help lower your monthly WAN expenses.



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Network Management Comparison

	Configuration methods	System-image location	Configuration-file location	Plug-and-play WAN	Compression algorithm	Serial speed per port
BayStack Access Node Hub	Console, console script, Quick2Config (Windows-based), SiteManager	Bootp server, flash PC Card	Bootp server, flash PC Card	Frame relay, Wellfleet HDLC	WCP	6 Mbps
Cisco 2516	Console, console script, Config Builder (optional)	Flash ROM	Bootp server, flash ROM	Frame relay, HDLC	Stacker, Predictor	2 Mbps
3Com NETBuilder Remote Office 221	Console, console script, Transcend (optional)	Flash ROM	Flash ROM, NetBuilder II	Frame relay, PPP	Stacker	1.54 Mbps

An installation batch file provided by Bay Networks is another method for initial router configuration. Using a terminal attached to the console, the batch file configures the router by asking for the router's configuration details in plain English. When the initial setup configuration is complete, the router can be fully configured in two ways: via the console command-line interface or through Bay Network's Site Manager. Site Manager is an SNMP-based application whose Windows GUI is identical to the GUI in Site Manager's Unix version.

You can use Site Manager to configure the remote router dynamically, remotely, or locally. With dynamic configuration, changes take place immediately but are not saved on the flash card. This means administrators can try out different configurations before committing to one. Remote configuration changes the configuration file on the remote router's flash card.

With local configuration, administrators create configuration files at the central site. These files then are copied onto the flash card to be delivered to the remote site or stored on the Bootp server for EZInstall. Locally created configurations can be used as a template for multiple installations.

All Access Node products have two synchronous ports and a 4MB flash card. Our test Access Node Hub included an 8-port Ethernet hub, ISDN BRI, and an RMON data-collection module. Bay Networks provides three different router OSs, whose main differences are in network protocol support. The ANH can be purchased with IP support only or with the Corporate Office suite of AppleTalk Phase 2, DECnet, IP, IPX, Banyan's VINES, and Xerox XNS.

Its WAN support includes frame relay, Point-to-Point Protocol (PPP), HDLC, SMDS, X.25 and ATM DXI. For ISDN subscribers, the ANH has dial-on-demand functionality and multilink PPP. A user-set threshold will bring up the second B-channel for ISDN bandwidth-on-demand.

Bay Networks provides multiple methods for managing traffic across the WAN link. All ANH interfaces can be set with both inbound and outbound filters. Filters are created easily using Site Manager's predefined list of packet types and properties. Traffic can be prioritized for time-sensitive data. Bay Networks compresses data using the Lempel-Ziv algorithm and Telco System's Dictionary.

For large networks, Bay Networks provides optional Unix-based Optivity Internetwork or Windows-based Optivity EZ-Internetwork software. Both packages can configure the routers and collect RMON data. For mid-size networks, there's Windows-based Optivity Campus 6.0.

BayStack Access Node Hub. Price: Rs 186,850. Bay Networks Inc., Santa Clara, CA; http://www.baynetworks.com.
(Indian subsidiary Bay Networks India, New Delhi; Indian partners Datacraft ICIM, Bombay; Microland, Bangalore; Ramco Systems, Madras; Unicorp, New Delhi.)

Cisco Systems Inc.

Cisco 2516

With so many configuration options and features, the Cisco 2516 is prime evidence of Cisco Systems' experience in the router market. The remote site router we tested was a fully loaded Cisco 2516, with ISDN BRI capability, a 14-port Ethernet hub, and two synchronous ports. It lists at $2,595. One continuing criticism of Cisco Systems is that it lacks a graphical configuration program. The many administrators experienced with Cisco products, however, will be comfortable with the Cisco 2516's configuration program.

Cisco's built-in AutoInstall procedure enables 2500 routers at remote sites to configure themselves automatically for frame relay or HDLC over the WAN interface. The routers then can retrieve the rest of their configuration files from a Bootp server located at the central site. Once the routers are connected over the WAN, the administrator can finish their configurations using a telnet session.

If the remote site is connected either point-to-point using PPP or via ISDN, an included batch file guides a user attached through the console port in creating a minimum configuration that will get the router attached to the WAN. The Cisco 2516 was the only router in this roundup to save the configuration files in ASCII. Administrators can edit the file easily using any text editor. A hard copy of the configuration can be kept for reference.

Although command-line interfaces generally involve a steep learning curve, Cisco's interface has some useful features that help users to recognize rather than memorize commands. The commands are grouped in a tree structure. When you begin to understand the logical groupings, everything falls into place. Cisco's powerful debugging features enable users to troubleshoot any problems with frame relay, ISDN, or point-to-point links.

The Cisco IOS operating system can be purchased with different sets of network protocol support. Along with the AppleTalk, IP, and IPX found in most routers, the IOS Enterprise set also supports DECnet, OSI, and Banyan's VINES. Routing protocols for large IP networks can be configured for OSPF, Cisco's proprietary IGRP, or Enhanced IGRP.

Cisco's dial-mapping gives an ISDN-connected remote router the ability to route directly to other ISDN-connected remote sites without passing through the central site. Packets with destinations at other remote sites trigger an event that establishes a direct ISDN call. Bypassing the central site saves time and money.

Making the best use of the WAN means keeping broadcast packets off the network. SAPs and watchdog keep-alive packets can waste precious bandwidth, and, in the case of ISDN, keep the line from tearing down. The Cisco 2516 can maintain hundreds of filters, customized to the bit level.

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HOW WE TESTED

Remote Routers

PC MAGAZINE LABS

We tested remote-site routers from Bay Networks, Cisco Systems, and 3Com to see how they perform in different environments. Remote-site routers may be simpler to deal with than central-site routers, but everything is relative.

These remote routers have some nice features, such as graphical interfaces and quick-configuration screens. But routers are inherently the most complex devices on the network, because they must fully interpret all the different network packets on the wire. 3Com goes one step further: It actually uses smart bridging in place of routing technology at the remote site to simplify deployment and upkeep.

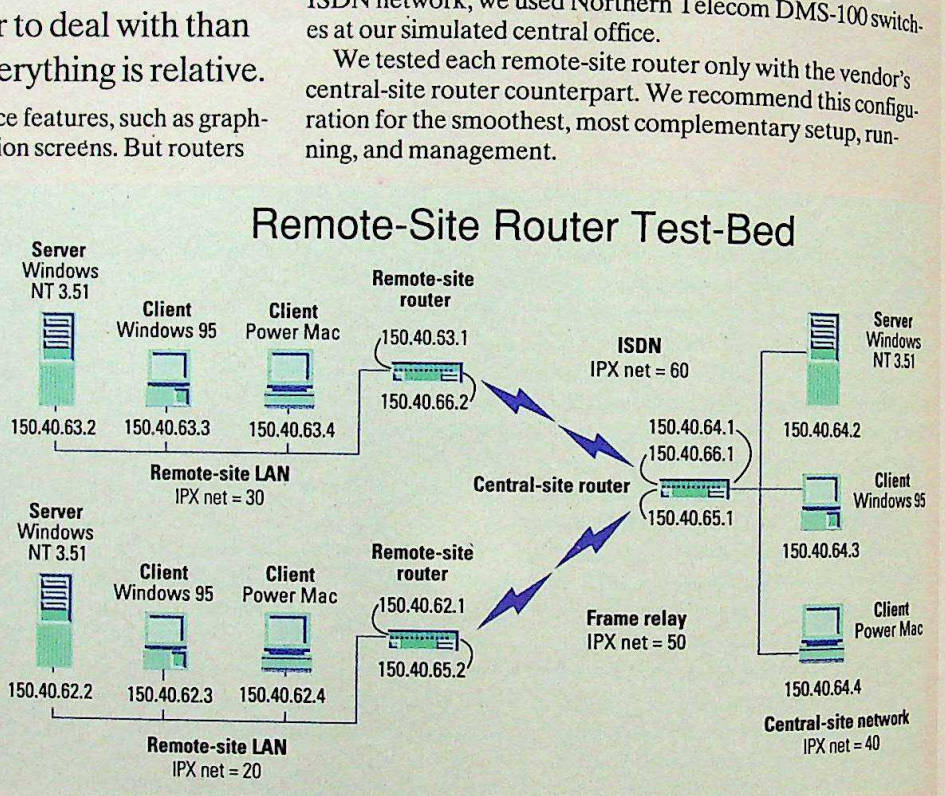
We tested these routers using a full range of network protocols, operating systems, and WAN connectivity options. We used Novell's NetWare and Microsoft Windows NT networking with the IPX/SPX, TCP/IP, and AppleTalk network protocols. We uncovered many nuances when testing the various protocol combinations.

Our suspicions were confirmed: To use routers effectively, you must first understand your own network extremely well.

We set up a network with three popular types of WAN connectivity: Frame Relay, ISDN, and Point-to-Point. For the Point-to-Point link, we used an Adtech Model SX/12 Data Channel Simulator configured to run at 128 Kbps. We ran HDLC and PPP data links over this simulated digital circuitry. For the Frame Relay and ISDN connections, we used Pacific Bell production networks. To connect to the ISDN network, we used Northern Telecom DMS-100 switches at our simulated central office.

We tested each remote-site router only with the vendor's central-site router counterpart. We recommend this configuration for the smoothest, most complementary setup, running, and management.

Remote-Site Router Test-Bed



Cisco's Snapshot Routing is also an excellent way to minimize traffic. Snapshot Routing keeps the routing table entries from expiring. If the remote site is connected to the central site via ISDN, the link can remain inactive for a long period of time. Once the link becomes active again, new routing information can reach the router and be stored.

To squeeze more out of limited WAN bandwidth, Cisco gives you a choice of Stac's Stacker or Predictor algorithms for data compression. The Cisco 2516 also can compress IP packet headers for a little bit of extra bandwidth.

Of the three products we reviewed, the Cisco 2516's security features were the most impressive. This router can be configured with 15 levels of user access. Security for ISDN connection is provided by PAP and CHAP authentication.

The remote site can be managed at the central location using Cisco's SNMP-based management packages. For the PC, there's Cisco Works with Windows ($2,495), which includes two applications: Configuration Builder and Cisco View.

Cisco 2516. Price: Rs 130,000. Cisco Systems Inc., San Jose, CA. http://www.cisco.com. *(Indian subsidiary Cisco India, New Delhi; Indian partners Apcom, Madras; Datacraft ICIM, Bombay; Microland, Bangalore; Wipro, Bangalore.)*

3Com Corp.

NETBuilder Remote Offic 221

PC MAGAZINE NETWORK EDITION EDITORS' CHOICE

At the low end of the 3Com NETBuilder line of routers is the ultimate in plug-and-play remote-site routing. The NETBuilder Remote Office 221 ($1,995) is perfect for a small branch office.

The Remote Office 221 comes equipped with a single Ethernet interface and two synchronous serial ports. The synchronous ports can be configured as one primary WAN link and one backup WAN link with T1-equivalent bandwidth. The Remote Office 221 is designed for small offices using IP, IPX, or AppleTalk protocols.

The key to the Remote Office 221's ease of deployment is Boundary Routing, a 3Com proprietary technology. Boundary Routing extends the network from the central site to the remote site, bridging WAN interfaces. Using a NETBuilder II at the central office, a virtual interface is created that starts at the WAN interface of the central site and extends to the Ethernet interface of the Remote Office 221.

The Remote Office 221's job is to forward packets with destinations outside the local subnet to the WAN interface. If the WAN link is frame relay or point-to-point, Remote Office 221 will be able to auto-con-

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figure the router without human intervention. Unlike the other products in this roundup, the Remote Office 221 does not require a Bootp server for its configuration.

A few quick commands at the NETBuilder II allowed us to create a virtual interface for the Remote Office 221. The virtual port enables the remote router to obtain its IP address through an inverse ARP command. Although assigning IP to the Remote Office 221's Ethernet interface is not a prerequisite for the router to work, the interface allows the router to be configured from the central site and enables some of the router's SNMP-based features.

To prevent the WAN from being bogged down by forwarded packets, 3Com created a technology called Smart Filter. The NETBuilder II observes the traffic over the virtual port and creates appropriate traffic filters. The filters then are transported to the Remote Office 221 using the SNMP implementation. The Remote Office 221 router can also store custom filters.

BOUNDARIES

Although Boundary Routing is an excellent way to connect your remote office, we encountered a couple of problems in our testing. If the remote site does not have a local server on the LAN, it can take several minutes for the remote-client stations to find a server on the central network.

During testing, the Windows 95 client timed out when it tried to log on to a Window NT Domain server on the central site. Skipping domain authentication and logging onto servers as needed is the workaround. Turning on compression and using a point-to-point connect also helps. 3Com is aware of the problems and is supplying its customers with workable solutions.

Although configuring the Remote Office 221 router through the console port is possible, it is probably best avoided because the command structure is not very intuitive. The commands can be accessed through a menu, but the menu options are not arranged in any logical order.

Menu lists often take more than a single screen, and the entire list must scroll by before the user can choose a command. The best way to interact with the command-line interface is to use a combination of memorized commands and menu selections.

If the Remote Office 221 router is not able to configure itself during boot-up, it automatically launches a configuration batch program to guide the console user through an initial configuration. The Remote Office 221 can be configured via SNMP using the Transcend application. 3Com believes SNMP-based configuration to be undesirable because of SNMP's lack of security.

Although the Remote Office 221 can be configured for either history-based or per-packet-based compression, 3Com recommends using the former, because, although its processing overhead tends to reduce throughput, it uses the bandwidth more efficiently. During testing, we found per-packet-based compression to result in faster throughput, but history-based compression achieved a higher ratio. 3Com licenses Stac's compression algorithm for its NETBuilder products.

3Com's Remote Office products can be managed using 3Com's Transcend management package. Transcend is available for $3,495 on Windows, $4,000 on SunNet Manager, and $9,495 on HP OpenView and NetView/6000 platforms. □

NETBuilder Remote Office 221. Price: Rs 85,000. 3Com Corp., Santa Clara, CA.http://www.3com.com.
(Indian subsidiary 3Com India, New Delhi;Indian partners Building Network Automation, Bangalore; CMS, Bombay; Exelan, Networking Technologies, Madras; Godrej Trading, Bombay.)

SUMMARY OF FEATURES

Remote-Site Routers

PC MAGAZINE NETWORK EDITION EDITORS' CHOICE

■ YES ■ NO

Products listed in alphabetical order	Bay Networks Inc. **BayStack Access Node Hub**	Cisco Systems **Cisco 2516**	3Com Corp. **NETBuilder Remote Office 221**
List price of tested configuration	$3,445	$2,595	$1,995
Processor	Motorola 68360	Motorola 68EC030	Motorola 68302
Flash ROM	8MB	16MB (tested configuration	4MB
Flash card	4MB or 8MB	None	None
List price of operating system	IP Access Suite: 4MB, $350; 8MB, $850. Remote Office Suite: 4MB, $750; 8MB, $1,250. Corporate Suite: 4MB, $1,850; 8MB, $2,350.	IP only, $1,200; IP/IPX, $1,600; desktop option, $2,200; enterprise option, $3,100	Included
WAN			
Number of serial ports	2	2	2
Serial speed per port	6 Mbps	2 Mbps	1.54 Mbps
Supports frame relay/PPP	■ ■	■ ■	■ ■
Supports HDLC/SDMS	■ ■	■ ■	■ ■
ISDN BRI	■	■	■
LAN			
Ethernet ports	10	14	1
RMON	■	■ (software only)	■
Router Configuration Method			
Console	■	■	■
Script	■	■	■
Windows utility	■	■	■
Supported IP Services			
Bootp	■	■	■
FTP	■	■	■
Telnet	■	■	■
Supported Network Protocols			
IP	■	■	■
IPX	■	■	■
AppleTalk	■	■	■
DECnet	■	■	■
VINES	■	■	■
XNS	■	■	■
SNA	■	■	■
Compression			
Algorithm	WCP	Stacker, Predictor	Stacker
Header	■	■	■
Payload	■	■	■

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HANDS-ON REVIEWS OF NEW NETWORKING PRODUCTS

ISDN ROUTERS

It's a Smooth Integrator



By Les Freed

If the word *router* conjures up visions of complicated configuration screens, constant parameter tweaking, and intermittent, inexplicable communications problems, then Shiva Corp. wants to show you a little something: the $1,299 Shiva Integrator 100. It's a single-BRI-line ISDN router in a neat, tidy, easy-to-install box. It's designed for small-, home-, and branch-office installations that require on-demand, high-bandwidth connections to another (usually larger) LAN. It can route IP or IPX protocols, and it can route both on the same network.

The Integrator 100 is about the size of a closed laptop, only a little thicker. The simple front panel hosts four large status LEDs. The equally simple rear panel hosts connections for an ISDN line, a 10Base-T connection, an RS-232 configuration port, an AC power connector, and an on/off switch.

Installing and configuring the Integrator 100 on an IPX network couldn't be simpler. First, you connect a PC with a VT-100 emulator program to the serial port via the supplied RS-232 cable. Any Microsoft Windows–based laptop will do. Power up the Shiva, type "install", answer a few questions, and you're done.

You'll need to know your ISDN phone numbers and SPIDs as well as the IPX LAN address of your server and the Ethernet address of the remote Shiva unit. We had the Integrator 100 up and running about 10 minutes after opening the box.

This product's small size belies its big performance. In informal testing, the Integrator 100 held its own with similar products from Ascend and Symplex. When used as an IPX router, it provides enough punch to make remote users feel they're connected directly to the main LAN. Small-file copy and directory search operations happen almost immediately, but large-file open and copy operations are noticeably slower than Ethernet speeds.

Because the Integrator 100 handles the IPX to ISDN conversion process, your remote PCs don't need any special software. They do need an Ethernet card and IPX protocol stack, just as they would if they were directly connected to the main LAN. If you're planning to install more than one workstation at each remote site, you'll also need an Ethernet hub at each site.

Because it's an external router, the Integrator 100 places no resource demands on your existing LAN servers. You just plug it into the LAN and run the configuration software.

The Integrator 100 can communicate with another of its own kind on either of the two ISDN B channels or on both. It can even communicate with two other Integrator 100s simultaneously by talking to different routers on the two B channels. If your needs outgrow the point-to-point capabilities of the Integrator 100, Shiva makes the Integrator 500 ($11,999), which provides two ISDN PRI interfaces. Each PRI line provides 23 B channels, allowing the Integrator 500 to connect as many as 46 remote users at once.

In most parts of the country, ISDN service is charged by the minute. Although individual minutes aren't expensive—usually only a penny or two—they do add up. The Integrator 100 uses various techniques to minimize connection times.

Continues on page 46

PHOTOGRAPHY BY THOM O'CONNOR

GATEWAYS

cc:Mail, Web-Style

By Padraic Boyle

With its new gateway software package, cc:Mail for the World Wide Web 1.0, Lotus Development Corp. takes cc:Mail to the Internet. This package provides most of the capabilities that desktop cc:Mail users have to remote-site cc:Mail users who have Internet access. The biggest difference is that users view mail with a Web browser instead of with the cc:Mail interface.

Though you're using the Internet, cc:Mail for the Web is merely a mail front end to cc:Mail; it doesn't give you instant Internet mail. A separate SMTP gateway must be purchased for those capabilities.

cc:Mail for the Web ($159) is a gateway software package that runs on a Microsoft Windows NT–based Web server with network or local access to cc:Mail post offices. Depending on your network configuration, there are Web server issues to consider: Users must be able to access the server across the Internet, which may take some modification if a firewall is involved. And to operate cc:Mail for the Web, the Web server must have access to one or more cc:Mail post offices.

As for the client side, a Web browser that supports HTML 2.0 is all you need. Users can be anywhere in the world; as long as they have Web browsers and Internet access, they can get to their mailboxes. Users can read mail, delete old messages, com-

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Ziff Davis Achieves Another Landmark

MICROPROCESSOR SUPPLIERS ADOPT PERFORMANCE RATING STANDARD BASED ON WINSTONE 96

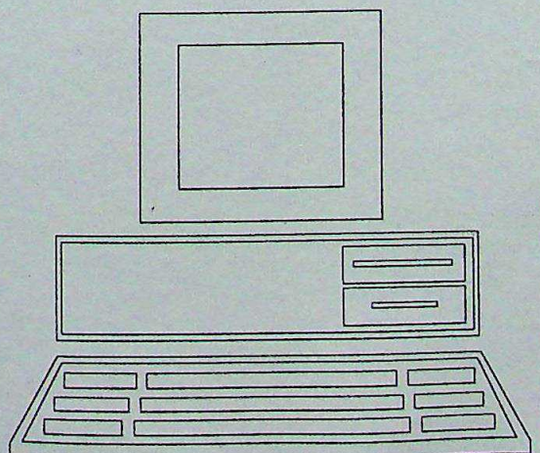
A performance rating standard based on the Winstone 96 benchmark developed by the Ziff-Davis Benchmark Operation (ZDBOp) and used worldwide by the Ziff-Davis Publishing Company's computer magazines has been adopted by **Advanced Micro Devices, Cyrix, IBM Microelectronics,** and **SGS-Thomson Microelectronics** as a new standardized specification to help consumers make PC buying decisions.

The new method indicates how fast a computer actually performs common tasks, regardless of the microprocessor's clock speed, or megahertz (MHz). The four companies call the measurement a P-rating, or performance rating, and are offering it as an alternative way to describe processor performance, instead of the megahertz clock speed measurement now used. The companies say that if consumers buy computers based solely on processor clock speed, they are not necessarily getting an accurate picture of how well the systems will perform real computer tasks.

According to P-rating developers, computer users are more interested in how fast their software applications are actually running. The P-rating indicates this performance level.

AMD, Cyrix, IBM and **SGS-Thomson** sell x86 processors that compete with Intel's processors. The new P-rating evaluation system indicates how such processors perform when compared with Intel Pentium processors. For example, a processor that delivers performance comparable to a 150 MHz Pentium processor is described as having a P150 rating, regardless of its own internal clock speed. "We've been using Winstone at PC Magazine for years, and believe it's the best real-world benchmark of standard business applications," said Michael Miller, VP and editor-in-chief of PC Magazine. "We're pleased with the broad acceptance Winstone has had among our readers, corporate users, and now the industry."

"This is a great endorsement of our benchmarking efforts," added Dan Farber, vice president and editor-in-chief of PC WEEK. "This is further proof of Winstone's status as the standard for evaluating Windows machines."



Winstone 96 benchmark test is a group of 13 common applications that PC users frequently use, such as MS Word and Excel. Test is run on a standardized computer configuration, so that all the results can be compared "apples-to-apples."

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Shiva Integrator

Continued from page 44

Like most routers, the Integrator 100 brings the ISDN link up when there's traffic on the LAN and drops the link after a user-definable period of inactivity. It has RIP and SAP spoofing, commonly used to prevent routing information and server broadcasts from needlessly bringing up the link.

The Integrator 100 also has a time-based Tariff Management scheduler that can limit ISDN usage during certain times. This feature can be used to limit the amount of time a given remote unit can spend on ISDN services; it can also be used as a security tool to prevent off-hours access to the LAN.

Other nice touches include remote administration via telnet, full SNMP support, support for PPP clients with PAP and CHAP authentication, Caller ID support, and a built-in AC power supply that doesn't require an external transformer.

Our sole complaint about the Integrator 100 is that the test units provided each had an S/T ISDN interface, which requires the use of an external NT-1 line interface. Shiva informed us that it is working on a U interface version, which should be ready by the time you read this.

Shiva Integrator 100. Price: Rs 86,000. Shiva Corp., Burlington, MA; http://www.shiva.com. *(Indian partner T-Net, Suite No. 180-184, The Claridges Hotel, 12 Aurangzeb Road, New Delhi 110011. Tel: 3010211, 3010604.)*

CROSSTALK



Frank Derfler

"Shiva was a pioneer in the remote-node server market, but it took them a while to get into ISDN. Meanwhile, competitors like Ascend and Gandalf shouldered into the market. The original version of this product shows its European roots in the lack of an NT-1, but it's only the first in a line of new Shiva products, including multiline systems, designed to hold onto market share."



Gail Shaffer

"Small routers like the Integrator 100 are great for linking LANs using IPX, but they work well for multiuser Internet and intranet access using IP, too. If you use a router for Internet access, you'll have to negotiate an IP subnet address with your access provider. These types of products are now right for any office with two or more nodes. Use them instead of separate ISDN terminal adapters for every desktop."

ISDN ROUTERS

Farallon Offers ISDN Routing with Netopia

By O. Ryan Tabibian

ISDN has always held the promise of high bandwidth at a low price, but for years it has been just a promise. Certain factors, however, are combining to make ISDN a viable connectivity option. Two of the biggest factors are the rush for fast Internet connectivity and the increased availability of ISDN from the phone companies. And Farallon Computing, with its recently released Netopia Internet Router, is one of the many companies ready to help people procure and manage their new ISDN connections.

The Netopia is part of the flurry of ISDN products now coming to market. These products range from routers to basic terminal adapters, and all of them promise to simplify ISDN connectivity. The Netopia, however, manages to deliver. Not only is it easy to use, but it also offers features to satisfy the most demanding ISDN user.

The Netopia also has excellent management options. It is one of the only ISDN routers we've seen that has built-in Dynamic Host Configuration Protocol (DHCP) support, which simplifies IP address management.

Using DHCP, you can define a range of IP addresses on the router that are automatically assigned to workstations running DHCP-compliant clients. This eliminates the need to configure individual IP addresses at each workstation on the network, which can be a logistical nightmare to say the least.

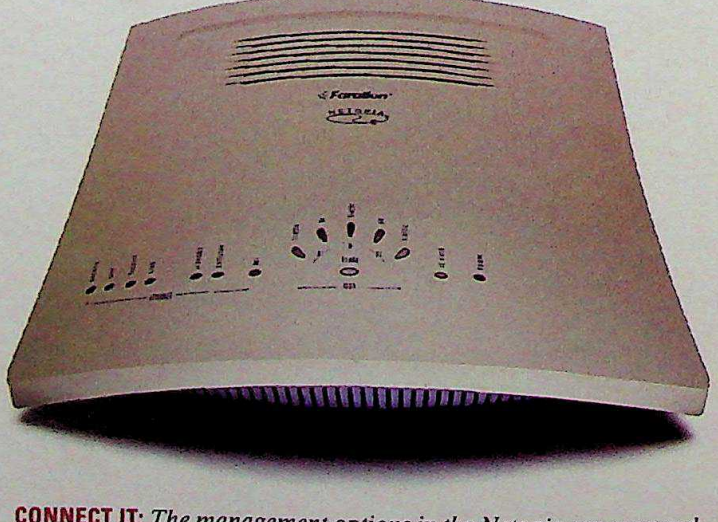
The Netopia was designed to be used primarily for direct connections to an Internet service provider (ISP). It can also, however, serve as an excellent remote-site router thanks to such features as dial on demand and schedule connections. These features allow you to determine when the router automatically establishes the connection.

To test how functional and easy to use the Netopia was, we installed two units in our Labs. We were impressed with the simple interface: It made configuration and management a snap. We had the product up and running in less than an hour. The process includes connecting the provided RS-232 cable to the PC's COM port and accessing the routers configuration menu using terminal emulation software.

Once connected, the intuitive menus walked us through the installation processes—entering the SPID number and configuring the IP interface, for example—step by step. Even though the interface was text based, we were impressed with its well-organized menus and simple configuration options. But we would like to see Farallon add a graphical configuration utility to simplify management for end users who may not be comfortable with traditional router configuration menus.

For those users weary of dealing with SPID numbers and arcane ISDN commands, Farallon offers an optional service that is called Up and Running Guarantee ($495 a year). If you purchase this option, Farallon will take full responsi-

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CONNECT IT: *The management options in the Netopia are outstanding, particularly the DHCP support.*

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cc:Mail

Continued from page 44

pose and send new messages, and access folders. In addition to the Internet, cc:Mail for the Web will operate in corporate intranet environments.

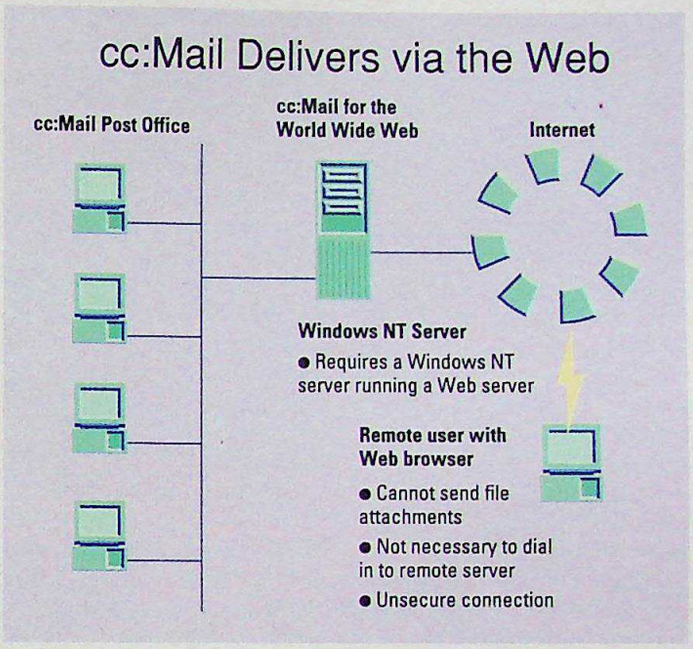
cc:Mail for the Web is simple to use, but not all functions found in the standard cc:Mail package are available. cc:Mail for the Web doesn't support off-line reading and composing features, it can't send file attachments, and it doesn't have return-receipt functionality. This limits you to the e-mail basics: reading, composing, sending, and forwarding mail. And cc:Mail for the Web is available only on a Windows NT Web server platform.

Our test configuration consisted of an HP NetServer 5/66 LF server with Windows NT 3.5 and Netscape's Commerce Server, Version 1.1. We ran an HP Vectra 5/90C with Windows 95 and Netscape Navigator 2.0 installed on the client. The server and client were connected using 10Base-T to simulate a remote, albeit high-speed, network connection.

We ran into a few minor problems during installation, all of which we solved after modifying a configuration file on the Web server. The configuration file, which contains file locations and post office paths, can only be edited with a text editor. Once configuration was complete, we easily gained access to our mailbox.

After you install the software, access to cc:Mail for the Web is available at a predetermined address. A Home Page requesting a Name and Password is presented to the client in a standard HTML form. After inputting valid names and passwords, users have full rights to their cc:Mail mailboxes, including all folders.

The user interface offers links to other functions of cc:Mail for the Web that are similar to the way a typical Web page operates. Forms are used to compose, send, and forward mail. If necessary, the user interface can easily be translated into five languages, including French and German, by simply selecting the language during log-on.



In addition, Lotus offers other gateway products, such as cc:Mail SMTP Gateway and cc:Mail to UUCP, that allow users to send and receive mail on the Internet via cc:Mail.

cc:Mail for the Web allows you to address mail to other users in the address book by typing in the name of the user. You can't view the address book, however; you must know the address you're inputting. But Lotus does offer a search function that lets you look up a user by name in the cc:Mail database.

cc:Mail for the World Wide Web 1.0. List price: $159. Lotus Development Corp., Cambridge, MA; http://www.lotus.com.
(Indian subsidiary Lotus, New Delhi; Indian partners ITC, Calcutta; Microland, Bangalore; Sonata, Bangalore.)

Netopia

Continued from page 46

bility for configuring and establishing the necessary connections for you.

On the hardware side, the Netopia comes with a single ISDN port, two RJ-45 Ethernet ports, a built-in NT-1 interface, and even PC Card slots so you can install modems for remote management of the device. Farallon has stayed true to its Macintosh roots by including both a LocalTalk port and AppleTalk routing in the Netopia.

The router also features multilink Point-to-Point Protocol (PPP), which allows you to use both 64K data channels on the ISDN line to transfer data simultaneously. In the past, most ISDN products were able to take advantage only of a single data channel, thereby limiting throughput considerably.

The Netopia sports an impressive design and provides a slew of useful LEDs to keep you abreast of the router status, ISDN channel status, and network traffic.

The Netopia also comes bundled with a host of applications to simplify Internet connectivity: Qualcomm's Eudora Internet mail reader, Netscape Navigator, and telnet and FTP utilities.

In sum, the combination of features and ease of use makes the Netopia Internet Router an excellent choice for anyone looking to connect their LAN to the Internet.

Netopia Internet Router. List price: $1,399. Farallon Computing Inc., Alameda, CA; http://www.farallon.com.
(Indian partners Anything Mac, 2F, 40 Yusuf Sarai, New Delhi 110016. Tel: 6867259; Fax: 6858682.)

RAID SYSTEMS

Renegade Opens the Gate

By Eric Harper

At around 70 cents per megabyte of storage, the Renegade RAID System from MountainGate Data Systems is a flexible, high-capacity storage solution offering fault-tolerant data protection. It also happens to be competitively priced. The Renegade has many crucial features, such as an auto-rebuild function, optional removable drives, and support for RAID levels 0, 1, 5, 6, and 7, with support for level 3 due out later this year. And the Renegade provides network managers with a superb solution for increasing storage capacity by offering up to 42GB of storage.

The Renegade, however, lacks some useful features that other RAID systems offer, such as tape backup and SNMP management. MountainGate says these features and others will be added within the year, so you may do well to wait until Renegade is upgraded. Or you can contact MountainGate for planned upgrade costs.

But we couldn't argue with the solid performance of this unit. We tested a Renegade with five 4GB drives, for a total of 21GB of storage, on a PCI Pentium with DOS, Windows 95, Windows NT, and NetWare 4.1 without a hitch. We pulled drives from the array during heavy network access and during the rebuild process. We pulled the hot-standby drive at the same time as an array drive. No matter

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what we tried, the Renegade kept humming along.

The Renegade, which supports Mac, PC, Sun, and SGI workstations, has room for 10 drives, hence the 42GB of storage. You can install the drives in any of the 10 open slots; however, the slots are arranged in two SCSI channels. MountainGate suggests dividing the drives between the channels for best performance. They will be adding support for two internal controllers later this year.

The drives support fast-and-narrow SCSI-2 or fast-and-wide SCSI-2 and offer data transfer rates of up to 20 MBps. And to enhance performance further, the Renegade provides up to 32MB of internal cache. Other fault-tolerant features include three ventilation fans, two load-sharing power supplies, and internal monitor programs that alert you when something is wrong.

With the drives installed, you are ready to define your array (or arrays). Rather than dedicate the whole system for one array, the Renegade lets you use the drives however you wish, even if it means creating multiple arrays.

For example, if you had six drives, you could take two and mirror them, then create a RAID 5 array with the remaining four. Each array has its own LUN for use by the host computer.

But you don't have to use all of the drives for an array. The Renegade lets you specify one drive as a hot backup. That way if any drive fails, the backup drive will automatically take over. When you replace the failed drive, it becomes the hot backup.

Defining arrays is accomplished through the menu system on the Renegade itself. There is a three-line LCD underlined with five buttons to navigate the menus and utilities. In case using the LCD display seems awkward, you can manage the system by attaching a terminal to the RS232 jack on the back of the Renegade unit. We loaded ProComm on a notebook, hooked it up, and found it worth the trouble.

You can also configure the RAID system to suit your needs best through the menu. Configurable parameters include automatic rebuild management, fault management, controller read-ahead functions, and stripe size. The documentation describes these parameters and explains the conditions under which you might want to change them.

The Renegade's documentation is adequate for physically installing the disk subsystem and configuring the arrays. As for getting the OS to access the drive and your SCSI controller to work with the rest of the components in the server, you're on your own.

An option you may be interested in is the ability to add up to two MountainGate IncreMeg drives in addition to the 10 RAID drives. The IncreMeg is a removable drive, completely encased in a sealed cartridge.

You can purchase IncreMeg docking stations for other computers on your network. To transfer data to your host quickly, plug the IncreMeg drives into the Renegade. Or you can use these drives to upload data to or download data from the RAID system.

Renegade RAID System. List price: With 42GB of storage, $30,000. MountainGate Data Systems Inc., Reno, NV; http://moutaingate.com.

(No Indian partner.)

MULTIPLE ACCESS By Steve Buehler

Toasted or Fried?



When your electrical contractors set up the power in your building, they followed the specifications of the National Electrical Code. So all your outlets are grounded, your hot and neutral are correct, and everything you plug in to a receptacle should work just fine. Right?

Not necessarily. The same copper network you use to send data between PCs can carry electrical current as well. It's possible, and even likely, that your departments or workgroups are plugged into different power transformers. If those transformers aren't grounded to the same reference, electricity can leak between your workstations with some spectacular results. If you have paid a lot of attention to your network topology but only a little to your network power, you may be facing some serious problems.

If you have paid a lot of attention to your network topology but only a little to your network power, you may be facing some serious problems.

The Institute of Electrical and Electronics Engineers (IEEE), a major standard-setting body, has some rigorous electrical requirements. It published *Powering and Grounding Sensitive Electronic Equipment* ($63.50) to describe recommended wiring and testing practices. But many electricians aren't aware of the specific steps in this guide and your network may suffer for it.

One company, American Power Conversion has a service to check out your premises and make sure everything is up to IEEE specs. The first step in the analysis is called Break Fix. For $1,999, an APC engineer shows up at your site, analyzes the specific problem, and delivers a list of corrections you can hand to your electrician. This may include recommendations for cabling, isolation, wiring changes, or installation of specific power-protection equipment.

A Capacity Audit ($3,999) is a whole-site inspection that can help you identify potential problems. This is great both for companies planning buildouts of new sites and for those nervous about their current cabling schemes. Since APC engineers truly understand networking hardware and cabling, even such small details as current looping through serial lines are explored and addressed in the hefty site report.

There isn't much competition for this service. Utility companies will do a power quality analysis for several hundred dollars and show you that they're delivering good power to your building. For about $25,000, your power company will provide continuous monitoring of the power in your building, but that misses the point. Your electrician or a UPS vendor can come on site and recommend specific fixes for known problems, but they usually can't help with planning for network growth and expansion. If you're looking to ensure that your network carry only data and not electricity that can damage your expensive hardware, consider that a Power Audit may be the only thing between you and that acrid smell of freshly toasted NICs.

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JIM SEYMOUR

The Risks (and Rewards?) of Innovation

The PC industry is built on innovation, of course. The old line that if the auto industry had progressed as far as PC makers have, we'd all be driving $500, 100-mile-an-hour limos getting 200 miles to the gallon has a whiff of truth about it. And business gurus invariably use the PC industry as the 20th century's preeminent example of the rewards—to both society and individual entrepreneurs—of technological innovation.

But innovation can get risky, especially for those who innovate most aggressively and for those who try to innovate within structured, maturing businesses, where widely adopted standards hold sway. Like, umm, the PC business.

As hotshot PC users, we like to pride ourselves on our openness to innovation. Indeed, we often say we *demand* aggressive development cycles for new products. Too often, that's so much hot air. When it comes to real innovation, we can be awfully retrograde in our openness. In large companies, many technology managers are actually complaining about the pace of innovation: By the time they get their POs approved, the products they're trying to buy have been superseded by new models. Couldn't we move forward just a little more *slowly?*

We've been held back for years by our devotion to the Intel *x*86 processor instruction set, in tandem with good old DOS. New alternatives may be better or faster . . . but unless a new product is compatible with everything on our desks now—and everything in our file cabinets and storage rooms—we're not interested, thanks.

What about Windows 95? Pentium chips? Notebook PCs? Evolutionary, all. And each of them burdened and ultimately compromised by our insistence that everything new work with everything old.

But surely innovation is a good thing. Compaq, for example, built a business around it, in a narrow sense. As cofounder and former CEO Rod Canion used to say, "Compaq innovates within The Standard." By which he meant that Compaq established itself with the first 20-pound, suitcase-size, portable IBM PC–compatible computer. But compatibility with the existing IBM PC/DOS standard was at least as important to the company's success as the portability of those Compaq luggables.

Now, Compaq is trying a riskier game. Indeed, Compaq makes a good case study of the risks, and possible rewards, of innovation in the PC business today. A recent visit to Compaq's campus in the piney woods country north of Houston confirmed that riskiness: Managers actually spoke of innovating *outside* the standard. That would have been heretical—even grounds for firing—just a few years ago.



EVOLUTION

PC innovations are burdened by our insistence that everything new work with everything old.

But Compaq—and Dell, Gateway, Hewlett-Packard, Micron, and everyone else in the PC systems business today—faces a tough problem: how to stay within the compatibility box, yet distinguish itself from the competition.

Lower prices aren't enough any more; prices fall every 90 days or so—*e eryone's* prices are low, and they're all about the same.

Performance is nearly as uniform as prices now. Intel chopped off at the knees PC makers' competitive advantage from in-house engineering innovation when it jumped into the PC motherboard business three years ago. In 1995, Intel made about a third of the motherboards in PCs sold in the U.S. Intel says it doesn't really want to be in the mobo business, hardly wants to stifle innovation, and selflessly builds all those mobos only to help its customers get new Intel chip designs to market more quickly. Sure, Andy.

As our PC Labs tests show, there are differences in performance within classes of PCs today, but usually only small differences among similarly configured machines from the top vendors. Performance still counts, certainly. But it's not nearly so hard or expensive to create, or even buy, competitive performance as it once was.

How else to compete? Well, though featuritis is still alive and kicking—witness Hewlett-Packard's silly little built-in snapshot scanner in its new PCs and Compaq's more useful page-size scanner built into its new keyboards—piling on features and gizmos isn't enough. Almost overnight, everyone else has those new gizmos too, because everyone buys from the same Asian sources.

Compaq's efforts in the recent past to bring real innovation to the PC market have met with mixed results. The engineering has been consistently good, but you and I haven't shown much respect for it. Compaq's unique, proprietary

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Good reasons for subscribing to *PC Magazine India*

The only Indian PC product evaluation magazine that conforms to international standards

1. *PC Magazine India* does not merely reproduce articles from *PC Magazine*. It adapts articles to Indian conditions by adding valuable inputs from the Indian market such as product availability, price in Indian rupees, value additions, names and addresses of dealers/resellers, and so on.

2. Each issue of *PC Magazine India* offers a wealth of information on the latest products released in the international market. The emphasis invariably is on practical aspects such as features offered, price advantages, quality, and performance.

3. The information published in *PC Magazine India* is authentic. Products are reviewed at PC Labs, acclaimed as one of the best adequately equipped testing labs in the world. PC Labs benchmarks are respected worldwide as among the most stringent and all-encompassing.

4. *PC Magazine India* also offers a panoramic view of the Indian IT industry. The coverage has drawn kudos from experts for being comprehensive, reliable, and timely. To conform to the high standards set by *PC Magazine*, information is sifted, processed, and cross-checked at every stage before being printed.

5. There is no other PC product evaluation magazine in India which gives as authoritative information as *PC Magazine India*. Which is the reason why readers have been jumping on to the *PCMI* bandwagon. Today, *PCMI* is the fastest growing computer magazine in India. You too should join the *PCMI* bandwagon; or you run the risk of becoming obsolete.

JIM SEYMOUR

TriFlex memory architecture was a better ide... when it was first introduced three years ago... and it's still a classic better idea. Unfortunate... ly, customers aren't yelling "attaboy!" and ru... ing up to purchase Compaqs because of... TriFlex; instead they're asking, "Umm, wa... how is that different from The Standard... Couldn't you just use the same memory archi... tecture everyone else does? You know, we li... to stay within . . . The Standard."

Don't shed any tears for Compaq, though... It's king of the hill in PCs right now, on top... the server market by a mile and headed, I thi... for a great couple of years. Even its lost-in-the... desert-lo-these-many-years portables busine... is back on track. It's doing lots of things rig...

That includes that new approach to innova... tion: Jump outside the box and push hard f... new extensions to The Standard. And in th... process, Compaq is showing its willingnes... both to give away to its competitors the fruits... its work in order to make these extensions pa... of The Standard and to knock heads when... thinks the other guys Just Don't Get It. The de... velopment of the new Universal Serial Bus is a... good example: A great deal of the work on th... standard, and much of the behind-the-scene... knee-breaking to get other vendors on board... was done by Compaq. Look for more of th... from Compaq later this year.

That's an especially risky kind of innova... tion. While Compaq is increasing the pie fo... everyone, it is gambling that it will be fastest t... market, in the most appealing implementa... tions, with these new extensions. If it fails on... either count, it will have spent its shareholders' ... money enriching its competitors.

Compaq executives acknowledge that it's ... a risky path but ask, fairly, if they have a... choice. As a market-leading, premium-price... brand, they can either push these outside-the... box innovations and then try to grab a disp... portionately large share of the rewards, o... they can see the reputation they've worked ... build—the reputation that allows them ... charge those premium prices—disappear...

I agree that this is the right kind of innova... tion for today's market: broad, far-reaching ... improvements in The Standard to which ... have become so wedded. Compaq benefits, ... the industry benefits; you and I benefit.

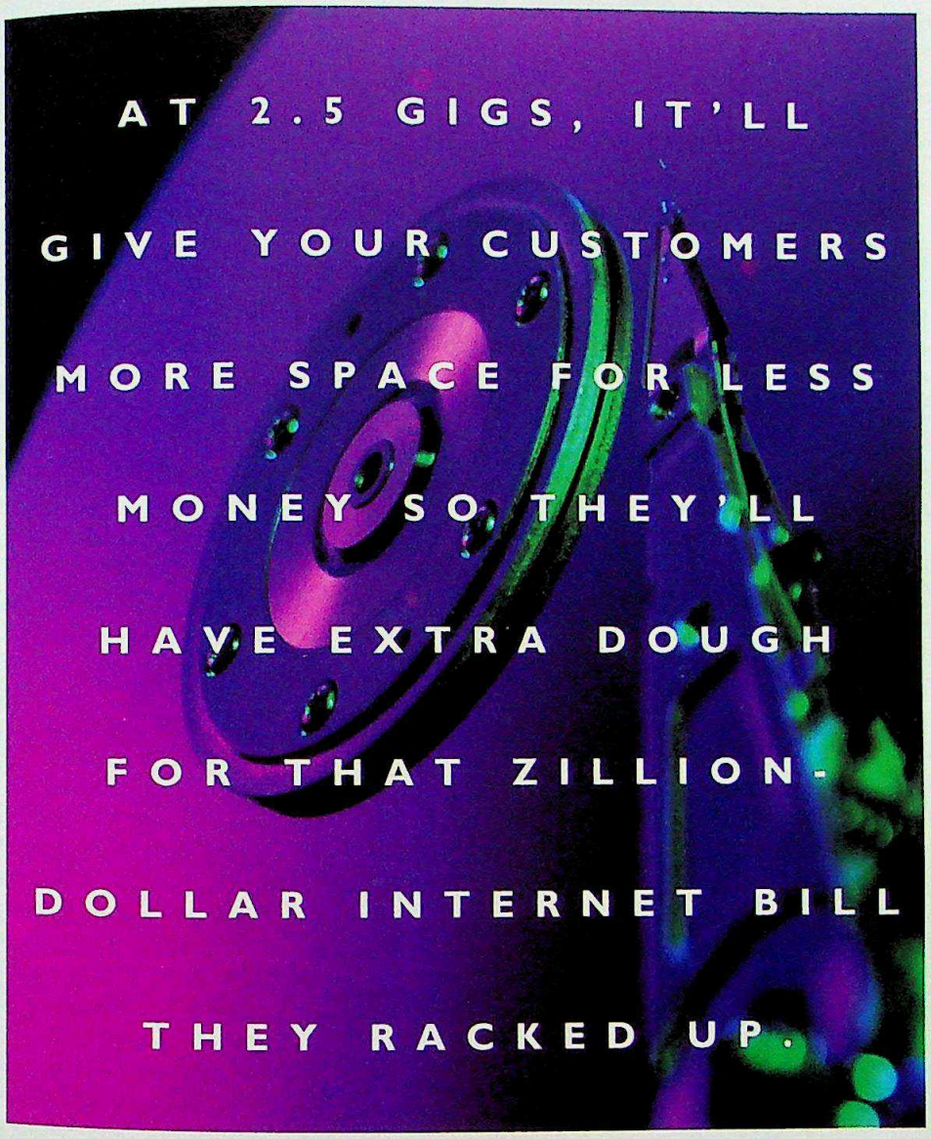
But it's still a risky strategy, one that de... pends not only on skillful execution but also ... on the great, imponderable variables in the ... equation: you and me. The real unknown... Are we still eager to acknowledge and reward ... innovation? □

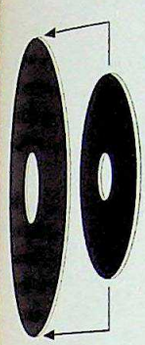
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MICHAEL J. MILLER

Remember Groupware?

Not too long ago, *groupware* was the hot buzzword. Everyone wanted to talk about the advantages of people working together in teams, like it was some big revelation. But fashions change, and as it so happens, groupware as a term never really caught on. But look at what's happened to the way most of us use computers. With the growth of networking in general, and the Internet in particular, everyone is communicating with one another. We all want to work together and better manage the way we communicate. No one thinks in terms of groupware anymore; now we say we want messaging and collaboration. But the basic concept is the same.

Microsoft has recently gotten a lot of publicity in this area with the release (*finally*) of Exchange, its messaging server for Windows NT. Exchange isn't everything Microsoft promised it would be when it was announced a few years ago, but it is a client/server messaging solution. And Microsoft backers talk about how you will be able to use it to create a messaging platform linked to the Internet.

Meanwhile, in client/server land, the strongest competitor seems to be Lotus Notes. Netizens like to talk about how Notes, with its unwieldy infrastructure and proprietary schemes, is passé. Still, since IBM acquired Notes, it has gotten stronger with growing sales, the shipping of Release 4, and more aggressive pricing. And Lotus hasn't ignored the Internet. If anything, the company is embracing it in Release 4 by integrating the InterNotes server for turning Notes databases into standard Web pages and by adding browser features to the Notes client. And Notes still has several features that other products don't, such as replication.

Almost overlooked in the Notes versus Exchange competition, though, is the fact that a number of other significant players are out there. Novell's Groupwise, for instance, is the Rodney Dangerfield of messaging systems: It doesn't get much respect, or much attention, but thanks to features such as advanced integration of a variety of media, it's selling very well. Novell is also at work on a new client/server version called Groupwise XTD.

Still, the real competition may well come from Internet-based products. Several companies, led by Netscape, are backing Internet standards such as Simple Mail Transfer Protocol (SMTP), Post Office Protocol (POP), and the Network News Transport Protocol (NNTP). Although we've yet to see these standards implemented successfully for messaging in large companies, at least SMTP and POP are open standards, and widespread adoption could eliminate troublesome gateways.



PHOTOGRAPH BY ANDY FREEBERG

FANTASYWARE

There's more than a little gap between the promise and what companies are delivering.

Consider some recent announcements from some unexpected sources. Digital Equipment Corp. is setting up a whole new division devoted to Internet tools, with a family of products carrying the name of its Alta Vista search engine for the Internet. Quarterdeck recently acquired DataStorm and its Procomm Plus, with integrated e-mail, fax, and browser features; as well as FutureLabs and its TalkShow technology for document sharing. Combine this with Quarterdeck's WebTalk program for transmitting voice over the Internet and its Prospero software for IRC chat and other extensions, and Quarterdeck has the makings of a real collaboration suite. But don't forget about Netscape, which is counting on the acquisition of Collabra and its Share technology to transform its immensely popular Navigator from a browser into a full-fledged client with integrated e-mail and discussion groups.

It all sounds pretty good. Yet in all these cases, there's more than a little gap between the promise and what these companies are actually delivering today. Notes, the closest of all these products to delivering on these promises, still relies on a proprietary mail scheme that requires gateways, and the program still isn't a complete Internet server. The rest are even further away. Exchange is untested and not well integrated with Microsoft's Web server software. Groupwise is under construction, and Netscape isn't shipping Collabra-developed products yet. Digital and Quarterdeck have some interesting products, but they have yet to be incorporated in an integrated scheme.

Where does this leave us? As usual, somewhere in limbo. A few years ago, we were all waiting for the magic groupware solution; now we are waiting for the ideal collaboration solution that also works with our messaging systems and, of course, comes from a single vendor. For now, we have to accept that the ideal solution remains just out of reach. □

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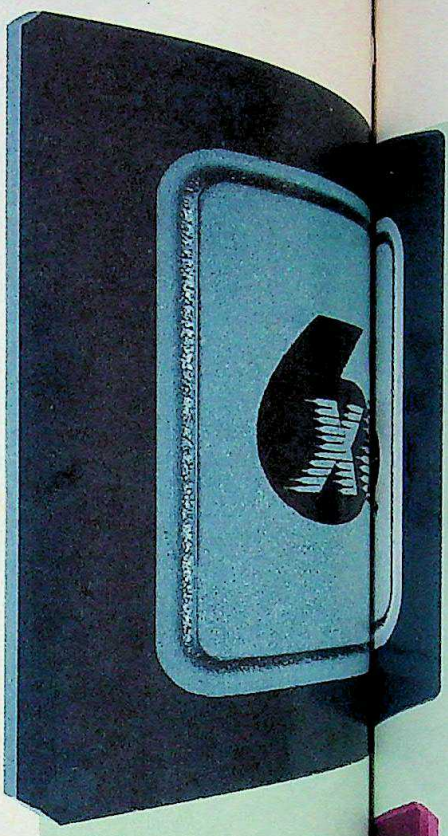
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PCs Beyond the Pentium



Intel's top challengers have reached the Pentium level, but do they pose a threat to the king of the CPU hill? We examine the chips and the vendors to find out.

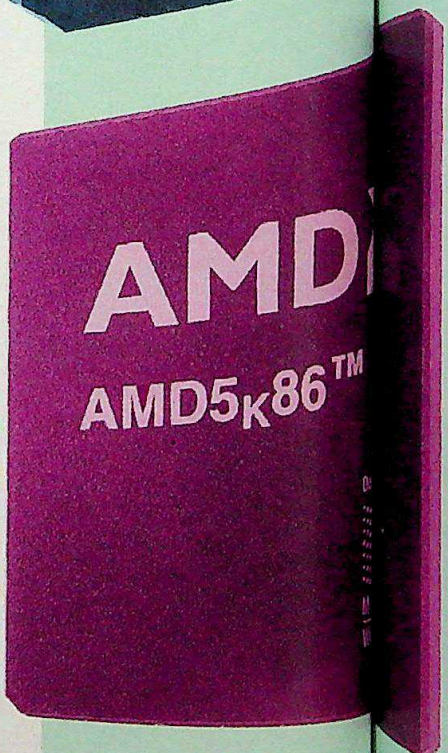
By Michael Slater

Over the past 18 months, the PC industry's rapid transition from the 486 to the Pentium has further entrenched Intel's position as the dominant supplier of PC microprocessors. As AMD, Cyrix, IBM Microelectronics, SGS-Thomson, and Texas Instruments tried to make ends meet while selling ever-cheaper 486 parts into a market that wanted Pentiums, NexGen struggled to find a market for its 586.

After many months of delay, Intel's top challengers, AMD and Cyrix, have finally moved up to the Pentium level. But given the wide range of designs and the convoluted naming schemes, sorting out the mix of products can be confusing. To understand today's and tomorrow's Pentium-class microprocessors, we need to look beyond the chip names, which no longer mean much. We need to look inside the chips to make sense of the technology and inside the companies making them to comprehend the business and marketing strategies that led to their development.

5x86: LAST GASP OF THE 486

AMD and Cyrix have both been selling devices called 5x86. Both the AMD and Cyrix chips plug into a 486 socket and deliver low-end Pentium performance. These chips are designed to fit into existing 486-based system designs, providing a performance boost to these least expensive PCs. Both companies chose the 5x86 name to conjure up a fifth-generation image while distinguishing their chips from NexGen's; chips with 586-like names sell far better than those with 486-like names regardless of the underlying



AMD 5K86 (K5)

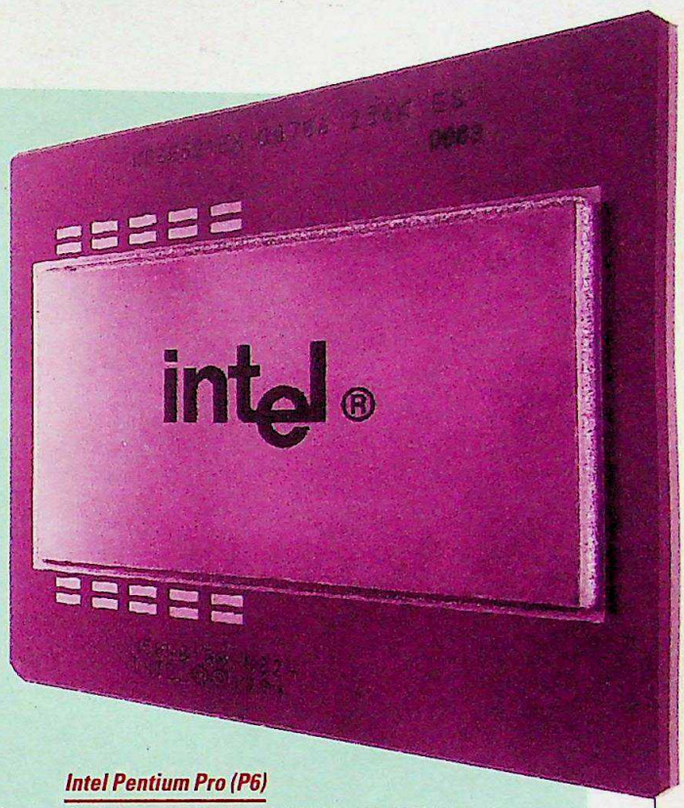
Clock speeds: 75 and 90 MHz (Pentium-pin-compatible)
P Rating*: Same as clock speed
Cache memory: 16K instruction, 8K
Design style: Four-issue RISC core
Transistors: 4.3 million
Die size: 181 mm² (0.35-micron)
Price (in lots of 1,000): 75-MHz CPU,
90-MHz CPU, $99
Up next: Enhanced 5K86 (30.96), K6

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Cyrix 6x86 (M1)

Clock speeds: 100 to 133 MHz (Pentium-pin-compatible)
P Rating*: 120, 133, 150, 166
Cache memory: 16K combined instruction/data
Design style: Flexible two-issue superscalar
Transistors: 3 million
Die size: 204 mm^2 (0.65-micron)
Price (in lots of 1,000): 100-MHz CPU, $199; 133-MHz CPU, $579
Up next: M2 (1Q 1997)



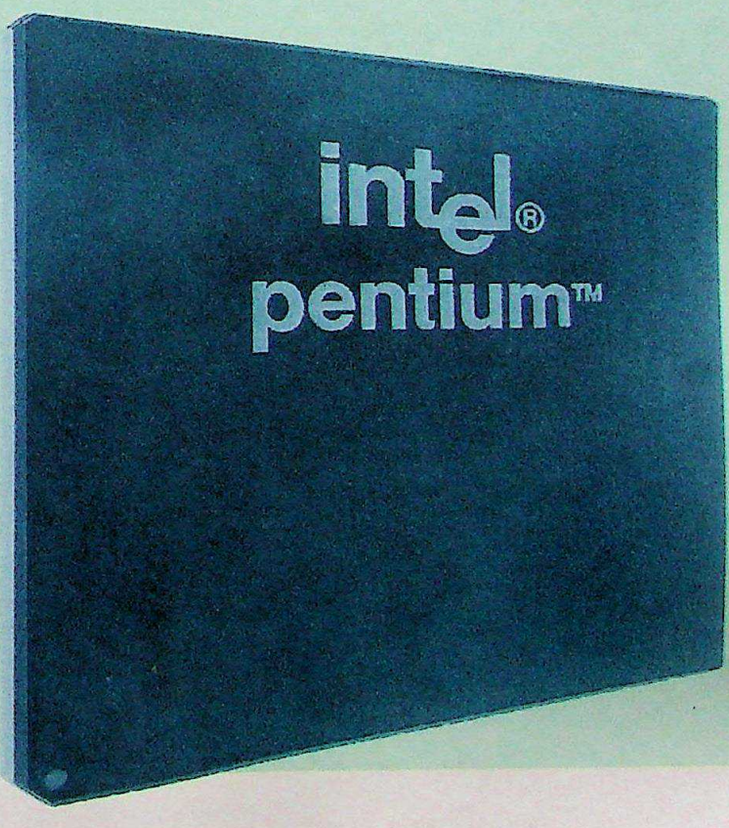


Intel Pentium Pro (P6)

Clock speeds: 166 and 200 MHz with 512K L2 cache; 150, 180, 200 MHz with 256K cache
P Rating*: Not applicable
Cache memory: 256K or 512K L2 cache on-board
Design style: Four-issue RISC core
Transistors: 5.5 million for CPU, 15.5 million for 256K L2 cache
Die size: 196 mm^2 (0.35-micron)
Price (in lots of 1,000): 150-MHz 256K-cache CPU, $804; 200-MHz 512K-cache CPU, $1,528
Up next: Klamath (1H 97)

IBM 6x86 (M1)

(same as Cyrix 6x86)
Clock speeds: 100 to 133 MHz (Pentium-pin-compatible)
P Rating*: 120, 133, 150, 166
Cache memory: 16K combined instruction/data
Design style: Flexible two-issue superscalar
Transistors: 3 million
Die size: 204 mm^2 (0.65-micron)
Price (in lots of 1,000): 100-MHz CPU, $185; 133-MHz CPU, $590
Up next: Cyrix M2 (1Q 97)



Intel Pentium (P5)

Clock speeds: 75 to 166 MHz
P Rating*: Same as clock speed
Cache memory: 8K instruction, 8K data
Design style: Limited two-issue superscalar
Transistors: 3.2 million
Die size: 91 mm^2 (0.35-micron)
Price (in lots of 1,000): 75-MHz CPU, $106; 166-MHz CPU, $632
Up next: 200-MHz CPU, P55C with MMX (4Q 96)

*The P-Rating indicates a CPU's performance relative to that of an Intel Pentium CPU. A P-Rating of 133 means that the CPU performs on a par with a Pentium/133.

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technology. While these chips offer low-end fifth-generation performance, both internally and externally they look more like enhanced fourth-generation designs.

Internally, however, the AMD and Cyrix chips are quite different. AMD ran into delays developing its 5K86 (code-named K5), which is its real Pentium competitor. Needing something to sell in the meantime, AMD decided to boost its 486 line to fill the gap until the 5K86 was ready. AMD's 5x86 is simply a 133-MHz 486DX4; it delivers performance comparable to a Pentium/75 but needs to run at the higher clock rate, because its CPU core is less efficient than a Pentium's.

5x86 designs will have a short life: Pentium-pin-compatible CPUs will win in the long run.

Cyrix's 5x86 is not based on the vendor's 486 CPU: It's an entirely new design—essentially an enhanced 486-type processor, borrowing a few tricks from Cyrix's 6x86. Because it is more efficient than any 486 but not as good as the Pentium in terms of performance per clock cycle, it can deliver Pentium/75-class performance with a 100-MHz clock. A 120-MHz version is comparable to a Pentium/90. But both 5x86 designs will have a short life span; neither company expects to pursue these products much past this summer.

CYRIX 6x86 LEADS THE PENTIUM CLASS

Although 5x86 chips with 486 pinouts do fill a gap, it is Pentium-pin-compatible devices that stand to gain some longer-term market share: Cyrix's 6x86 and AMD's 5K86. Both use internal designs somewhat more sophisticated than the Pentium but not as advanced as the Pentium Pro. Dealing with a "fifth-generation-plus" design, Cyrix chose to leap ahead in nomenclature and call its chip the *6x86,* while AMD went with the more conservative *5K86.*

Cyrix's 6x86 is the first real chink in Intel's armor. The 6x86 achieves what no other Intel-compatible CPU has done before: It outperforms Intel's fastest mainstream chip, currently the Pentium/166. Its performance is based not on raw clock speed but on architectural efficiency within the chip. Running at just 133 MHz, the best 6x86 we tested outran a Pentium/166 on Winstone 96 by 5 percent.

Cyrix does not have its own semiconductor manufacturing plants (fabs). With a price tag of $1 billion or more for a leading-edge fab, smaller companies like Cyrix must depend on alliances with existing manufacturers. The 6x86 is now manufactured for Cyrix by IBM Microelectronics, and both companies market the chip. In a few months, SGS-Thomson should begin manufacturing the 6x86 for Cyrix as well and will also sell it under its own name.

The 6x86 puts Cyrix into an entirely different market segment than it has played in previously. Earlier Cyrix chips delivered a good compromise between price and performance but were not leading-edge designs. Cyrix is now trying to shed its "economy" association and become known as a performance leader. The company is even going so far as to enter the system business so it can ensure that top-notch systems are built with its chips and aggressively marketed to create an upgraded brand identity.

GETTING RID OF MHz

Since the 6x86 is so much faster at a given clock speed, it was essential for Cyrix to move PC buyers' focus away from megahertz. To do this, Cyrix, in collaboration with its partners IBM Microelectronics and SGS-Thomson and its competitor AMD, developed the P-Rating Specification, which defines an approach to measuring performance relative to the Pentium based on comparing Winstone 96 results in a constant system configuration. Winstone 96, developed by Ziff-Davis Benchmark Operation, is a benchmark test suite used extensively by *PC Magazine* and other Ziff-Davis publications as a cornerstone of PC testing.

MicroDesign Resources, a Ziff-Davis subsidiary that provides technical analysis to the semiconductor and PC industries, is providing independent benchmark tests in conformance with the P-Rating Specification. Results of these tests are available in reports posted at MicroDesign's Web site (*www.chipanalyst.com*).

The processor vendors will avoid using MHz at all, calling the 133-MHz 6x86 chip, for example, a 6x86-P166+. The "+" at the end is not a part of the P-Rating standard but is a Cyrix marketing device intended to indicate that the chip's Winstone 96 performance not only matches that of the 166-MHz Pentium but exceeds it. In addition to the 6x86-P133+, Cyrix offers chips rated at P120+ (running at 100 MHz), P133+ (110 MHz), and P150+ (120 MHz). The "+" is justified for the P150+ and P166+ parts, which have an edge of several percent over the Pentium in a range of system configurations.

THE 6x86'S LIMITATIONS

The 6x86 lags the Pentium in clock rate primarily because it is currently built using a less-advanced semiconductor process technology than Intel's. IBM builds the 6x86 chips using what is called a 0.65-micron process, while Intel's fastest Pentiums (currently the 133-, 150-, and 166-MHz Pentiums, as well as the 200-MHz Pentium Pro) use a 0.35-micron process. The smaller the process dimension, the faster the chips run and the cheaper they are to make. In the second half of this year, Cyrix expects to move to a more advanced process, increasing the number of 133-MHz chips it can make and boosting the top clock speed to 150 MHz. At 150 MHz, the 6x86 should deliver performance close to the 200-MHz Pentiums due to ship this fall—especially if Cyrix succeeds in pushing the system bus speed to 75 MHz.

The 6x86 has two notable limitations. First, it is power-hungry. In a worst-case scenario, the 6x86-P166+ dissipates more than 21 watts, far more than Intel's 166-MHz Pentium (14.5 watts) under the same conditions. This requires 6x86 system makers to pay more attention to cooling and eliminates the portable computer market from the 6x86's realm.

The second limitation is floating-point performance. The P Ratings of the chips

Our Contributors: MICHAEL SLATER is editorial director at MicroDesign Resources and publisher of *Microprocessor Report* (*mslater@mdr.zd.com*). CADE METZ is a staff writer at *PC Magazine*. CAROL VENEZIA was the associate editor in charge of this story, and RICHARD FISCO was the project leader.

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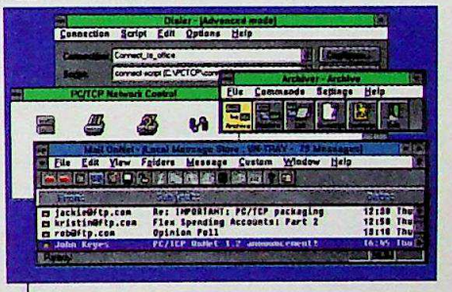
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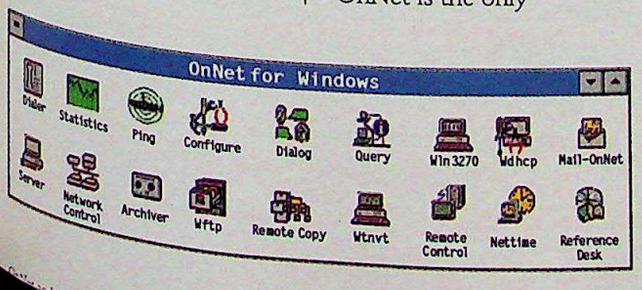


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BENCHMARK TESTS

Pentium Competitors

PC MAGAZINE LABS

Under Windows 95, the 6x86 gave the Pentium a run for its money. But under a 32-bit operating system—like Windows NT Workstation or OS/2 Warp Connect—the Pentium Pro, which was optimized for 32-bit code, led the pack.

What the Numbers Mean

We tested four PCs powered by Cyrix 6x86 processors: two with the P150+ (120-MHz) version of the CPU and two with the P166+ (133-MHz) version. We ran popular 32-bit applications on these systems to find out how well their performance scaled under Microsoft Windows 95, Microsoft Windows NT Workstation 3.51, and OS/2 Warp Connect 3.0. We then compared their performance against similar Pentium and Pentium Pro PCs.

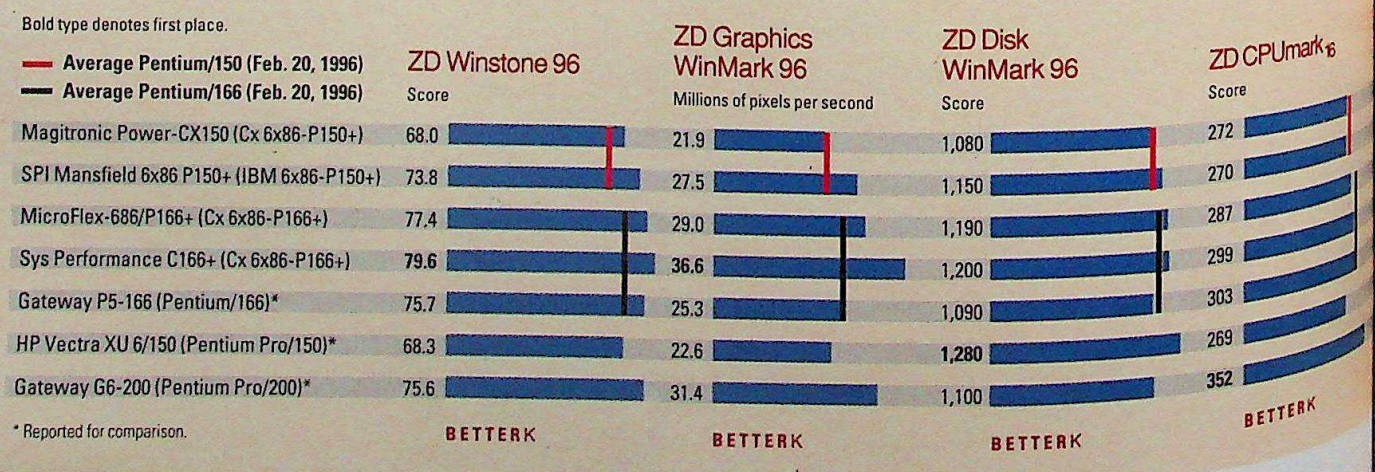
We chose applications by researching what users actually run on these operating systems. For Windows 95 testing, we used our industry-standard Winstone 96 and WinBench 96 benchmark tests. For Windows NT testing, we used 32-bit applications that run under both Windows 95 and Windows NT. To emulate power-user applications, we chose Adobe Photoshop 3.04; AutoCAD, Release 13 for PCs, C3 Version; Symantec's C++ Compiler 7.20; CorelDraw 6.0; and Micrografx's Picture Publisher 6.0. To emulate what an average user looking for top-flight performance might choose, we used Microsoft Excel for Windows 95 7.0 and Microsoft Word for Windows 95 7.0. We decided not to use Windows 3.*x* applications under OS/2, because we wanted to stay with 32-bit applications, and Windows 95 apps will not run under OS/2. For OS/2 testing, we chose SPG's ColorWorks for OS/2, Version 1.0, and IBM's Visual Age C++ for OS/2, Version 3.0.

We tested under different memory configurations to achieve results that would compare with those garnered by common end-user configurations; these results provide a reasonable means of comparing processor performance. For testing under Windows 95 and OS/2, we installed 16MB of RAM, which served as the common configuration. We also conducted OS/2 testing with 32MB of RAM to ensure that the tests would be less bound by disk I/O and that the systems' CPU performance would account for more of the results. For testing under Windows NT, we loaded each system with 32MB of RAM, which served as the common configuration; we also tested with 64MB to lessen the impact of disk performance. (In fact, 64MB of RAM or greater is probably more common than 32MB for professionals using applications like Photoshop and Picture Publisher.) With more memory installed, an operating system's need to swap to disk is greatly reduced and on some tests eliminated, providing results that reflect the processor subsystem's performance to a greater degree.

Our benchmark tests under Windows 95 and our applications tests under Windows NT with the systems running 64MB of RAM yield results that best isolate the processor subsystem. Even results gleaned under OS/2 by systems running 32MB of RAM reflect disk I/O, but to a lesser degree than the 16MB results do; the 32MB results better reflect overall system performance. Graphics subsystem performance also influenced test scores, although to a lesser degree than memory and disk subsystems did, because most of our tests are not graphics-intensive. Although you might suspect that tests under Adobe Photoshop, Picture Publisher, and ColorWorks would stress graphics processing, in fact they heavily stress CPU processing, spending much time conducting complex rendering and filtering calculations prior to painting the screen.

Windows 95 Tests The Sys Performance C166+ from Sys Technology led the Cyrix-based systems on both the CPUmark$_{16}$ and CPUmark$_{32}$ test suites, which are synthetic benchmark tests meant to isolate processor, cache, and memory subsystem performance with no disk and graphics I/O. When compared with a Pentium/166-based PC, however, the Cyrix P166+ machines had scores 1 to 9 percent lower on our CPUmark tests. The two 6x86 P150+ systems' scores were also up to 2 percent lower than the average Pentium/150 PC. These results are based on systems using Intel's 430FX PCIset (Triton) chip set, which does not support the 6x86's linear-burst mode. The 6x86 instead has to use a Pentium-compatible burst mode that introduces an extra bus cycle in about half of all burst transfers. This factor affects Cyrix systems' CPU performance under any operating system. When chip sets that support the 6x86's linear-burst mode become available, the 6x86

MICROSOFT WINDOWS 95



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...ould be able to catch up or even exceed the Pentium in CPU ...formance as measured on our benchmark tests.

Our Winstone 96 tests measure system performance with 16-bit ...plications. The fastest 6x86-P166+ system beat the comparison ...ntium/166 by 5 percent and beat our average P/166 PC by a ...mfortable 15-percent margin. The two P150+-based systems also ...eat the Pentium/150 average by as much as 15 percent. With their ...ghly faster disk subsystems and strong graphics performance, the ...x86-P166+–based systems topped the charts on our Winstone ...sts. For now, it appears that the Cyrix 6x86 processor has stolen ...e performance lead from Intel when running on 32-bit operating ...stems that still contain 16-bit code, such as Windows 95.

Our Disk WinMark 96 and Graphics WinMark 96 tests measure ...sk and graphics subsystem I/O, respectively. The two 6x86-P166+ ...stems, both using Quantum Fireball 1280A hard disks (historical-...e fastest Enhanced IDE disks we have tested), were able to ...eat out the comparison Pentium/166 PC, as well as the average ...sted by the Pentium/166 machines tested in our roundup of ...bruary 20, 1996. The 6x86-based systems (except the Magitronic ...wer-CX150) each used a Matrox MGA Millennium graphics ...rd. The 6x86-P166+ units showed surprising muscle on our ...raphics WinMark test, posting scores about 29 percent higher ...an those garnered by the reference Pentium/166 PC.

For comparison, we tested two Pentium Pro machines running ...indows 95: the Gateway G6-200 and the HP Vectra XU 6/150. As ...pected, the Pentium Pros did not fare well under Windows 95. ...though the Pentium Pro's out-of-order, decoupled execution ...gine increases performance when executing 32-bit compiled ...de, it causes stalls in 16-bit applications (such as those in our ...instone 96 test suite) that frequently load segment registers. ...rtain operations in handwritten assembler code can also cause ...ntium Pro pipeline stalls. Specifically, 16-bit code can stall when-...er an 8-bit partial register update is followed by a read of the full ...-bit version of the register. Windows 95 still contains handwritten ...sembler code that may cause the partial register stalls on a Pen-...um Pro unit.

...indows NT Workstation 3.51 Tests Perhaps the most telling ...t results are the scores posted on the 64MB applications tests ...der Windows NT. When run on systems with 32MB of RAM, ...me of our Windows NT tests are still influenced by disk perfor-...nce. While disk, CPU, memory, and graphics showings give an ...erall view of system performance, concentrating on the 64MB memory configurations can reveal CPU and memory subsystem performance characteristics and minimize disk impact. For the purpose of analysis, we concentrate on 64MB test results to determine processor/memory subsystem performance.

Our most stressful graphics tests were those involving Word and Excel, because these programs stress integer and graphics operations by quickly updating the screen in rapid succession. These tests, however, do not appear to stress memory subsystems beyond 32MB of RAM, as evinced by the nearly identical results obtained at both memory configurations. The top-scoring 6x86 machine, the Sys PC, was edged out by the Pentium/166 reference system in Word and by the two Pentium Pro comparison systems (by a comfortable margin) in both Word and Excel.

The AutoCAD test run with 64MB of RAM displays intermittent, heavy disk I/O and is graphics-intensive. This test uses both integer and floating-point calculations. The results showed that the Pentium/166 comparison system was slightly slower than the fastest 6x86 machine, the Sys PC, although both Pentium Pro PCs were up to 71 percent faster.

Our C Compiler test does not stress graphics performance; instead, it exercises the CPU subsystem and includes heavy disk I/O, even with 64MB of RAM. Helped by its strong disk performance, the Sys PC was 11 percent faster than the Pentium/166 comparison unit, although it was beaten by both Pentium Pro workstations.

The Gaussian Blur test under Photoshop uses integer calculations and utilizes minimal disk I/O with 64MB. The top-performing 6x86-based system was the Sys PC, but the Pentium/166 comparison machine was able to beat it by a small margin. Both Pentium Pro systems easily outperformed the Sys PC with 64MB—the HP Vectra XU by nearly 90 percent and the Gateway G6-200 by 140 percent.

The Lighting Effects test under Photoshop stresses floating-point operations and heavy disk I/O, even on systems with 64MB of RAM. Again, the fastest 6x86-based machine was the Sys PC, but again it was beaten by all the comparison systems. In fact, the Pentium/166 beat the Sys PC by more than 25 percent on this test, possibly a result of enhanced floating-point processing ability compared with the Cyrix chip. It was here that the Pentium Pro processor exhibited its floating-point performance muscle. The HP Vectra XU 6/150 beat the Sys PC by 41 percent, while the Gateway G6-200 outran the Sys machine by an impressive 55 percent.

Our three Picture Publisher tests exercise different CPU calcula-

continues

MICROSOFT WINDOWS NETWORK STATION 3.51

Lower scores represent better performance. Bold type denotes first place.	Microsoft Excel Script		Microsoft Word Script		AutoCAD		C Compiler	
	32MB	64MB	32MB	64MB	32MB	64MB	32MB	64MB
	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec
Magitronic Power-CX150 (Cx 6x86-P150+)	0:57	0:57	0:41	0:41	5:26	5:43	3:35	3:22
SPI Mansfield 6x86 P150+ (IBM 6x86-P150+)	0:40	0:39	0:32	0:32	5:43	5:29	3:01	2:59
MicroFlex-686/P166+ (Cx 6x86-P166+)	0:46	0:42	0:36	0:33	5:39	5:19	3:02	2:59
Sys Performance C166+ (Cx 6x86-P166+)	0:39	0:38	0:31	0:30	5:22	5:11	2:51	2:50
Gateway P5-166 (Pentium/166)*	0:41	0:40	0:28	0:30	5:29	5:14	3:11	3:09
HP Vectra XU 6/150 (Pentium Pro/150)*	0:32	0:31	**0:22**	**0:22**	3:56	3:48	2:22	2:22
Gateway G6-200 (Pentium Pro/200)*	**0:30**	**0:27**	0:23	0:23	**3:26**	**3:01**	**2:06**	**1:58**
Average Pentium Pro/150 (Feb. 20, 1996)	0:39	0:37	0:28	0:27	4:13	4:05	2:26	2:20

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BENCHMARK TESTS

continued
tions, with no stress put on the graphics subsystems and no disk I/O with 64MB of RAM. The Gaussian Blur and Hue Saturation tests stress integer performance. The File Rotate test is mostly FPU-intensive, with some integer calculations as well.

On the Gaussian Blur test, the Pentium/166 reference system edged out the top 6x86, the Sys PC. Similarly, the two Pentium Pro–based machines, with their more powerful processing ability on 32-bit code, beat the Sys machine by a wide margin. The integer-based Hue Saturation test shows the 6x86 chip's performance lead when the chip deals with the more common math calculations that processors perform. With 64MB RAM, the Sys PC beat the Pentium/166 comparison system by 8 percent and scored only 15 percent lower than the Pentium Pro/150–based PC.

Using CorelDraw 6.0, we were able to test the systems' floating-point performance, effectively eliminating all influence from disk activity. Except on the Grouping Vector Object test, which may contain some integer calculations, the Gateway P5-166 with 64MB of RAM edged out the top-performing 6x86-based PC, the Sys, in all cases. None of the CorelDraw tests showed physical disk usage, so we can draw some strong conclusions about CPU/memory subsystems from these tests.

MICROSOFT WINDOWS NT WORKSTATION 3.51

Adobe Photoshop

Lower scores represent better performance. Bold type denotes first place.	Gaussian Blur 32MB Min:sec	Gaussian Blur 64MB Min:sec	Lighting Effects 32MB Min:sec	Lighting Effects 64MB Min:sec
Magitronic Power-CX150 (Cx 6x86-P150+)	0:59	0:40	1:44	1:23
SPI Mansfield 6x86 P150+ (IBM 6x86-P150+)	0:55	0:39	1:42	1:24
MicroFlex-686/P166+ (Cx 6x86-P166+)	1:07	0:37	1:43	1:05
Sys Performance C166+ (Cx 6x86-P166+)	1:04	0:36	1:41	1:05
Gateway P5-166 (Pentium/166)*	0:48	0:33	1:07	0:51
HP Vectra XU 6/150 (Pentium Pro/150)*	**0:31**	0:19	**1:00**	0:46
Gateway G6-200 (Pentium Pro/200)*	0:46	**0:15**	1:06	**0:42**
*Reported for comparison.	JBETTER	JBETTER	JBETTER	JBETTER

MICROSOFT WINDOWS NT WORKSTATION 3.51

CorelDRAW

Lower scores are better	Blending Two Objects 32MB Min:sec	Blending Two Objects 64MB Min:sec	Rotating Vector Object 32MB Min:sec
Magitronic Power-CX150 (Cx 6x86 P150+)	0:58	0:54	1:11
SPI Mansfield 6x86 P150+ (IBM 6x86 P150+)	0:46	0:47	1:08
MicroFLEX-686 (Cx 6x86 P166+)	0:53	0:50	1:15
Sys Performance C166+ (Cx 6x86 P166+)	0:50	0:47	1:06
Gateway P5-166 (Pentium/166)	0:44	0:46	1:05
HP Vectra XU 6/150 (Pentium/150)*	0:35	0:36	0:53
Gateway G6-200 (Pentium Pro/200)*	0:42	0:38	0:47
	JBETTER	JBETTER	JBETTER

are based on Winstone 96, which—like the vast majority of today's PC applications—uses little floating-point math. For computer-aided design and some 3-D applications, however, the 6x86 will fall short of Pentium performance, because its on-chip math coprocessor is not as fast as the one in the Pentium—a weakness shared by all the Pentium alternatives.

AMD LATE TO PENTIUM CLASS

In the 486 era, AMD was the clear number-two player, behind Intel, and sold far more 486 chips than Cyrix. AMD's 486 was not an original design, however, but was derived from Intel's design. Starting with the Pentium generation, AMD decided—for both legal and technical reasons—to develop its own design. But lack of *x*86 design experience turned out to be a stumbling block: AMD found that the much-heralded 5K86 (originally called the K5) took longer to bring to market than the company had hoped—and it needs still more refinement to reach its performance goals.

AMD's first Pentium-pin-compatible chips, the 5K86-P75 and 5K86-should be shipping by the time you this. These chips are at the low end Pentium performance spectrum, so ing is aggressive ($75 and $99 for tium/75 and /90 equivalents, respecti

Like Cyrix's 6x86, the 5K86 more advanced internal design that supposed to deliver higher perform than the Pentium at a given clock rate fortunately, the initial version of the design failed to deliver on this pro

AMD ran into trouble, becau

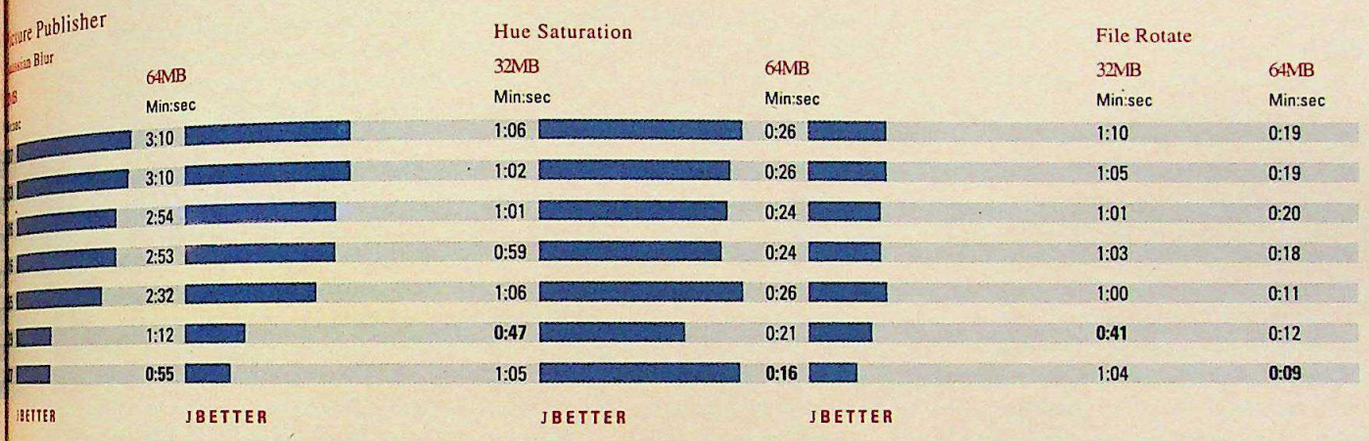
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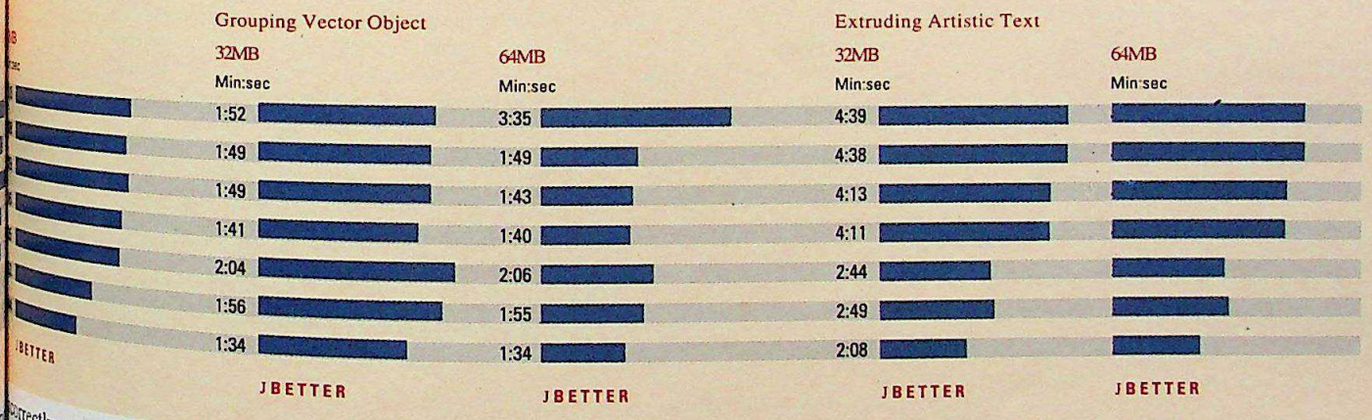
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On tests emphasizing floating-point-unit performance, the Pentium Pro comparison systems evinced their FPU prowess. The HP Vectra XU bested the Sys PC by 25 to 50 percent, and the Gateway G6-200 beat it by 25 to nearly 100 percent on all but the Grouping Vector Object test. There are few applications that use floating-point calculations, but these results show that Intel has a command-ing lead in floating-point performance, at least in the *x*86 world. The Pentium/166 comparison system again showed the possibility of an enhanced FPU by edging out the Sys machine on the Blend-ing and Rotating tests, as well as by eclipsing the Sys machine by 53 percent on the Extruding Artistic Text test.

OS/2 Warp Connect 3.0 Tests Testing under OS/2 Warp Connect 3.0 confirmed what IBM has long claimed: OS/2 is a true 32-bit operating system with little 16-bit code. Tests run on the two Pentium Pro systems particularly helped to lead to this conclusion. As expected, the Gateway G6-200 and the HP Vectra XU 6/150 were better performers under Windows NT than under Windows 95. It is well documented that the Pentium Pro chip cannot handle the segment loads and partial dependencies that can happen with the 16-bit code still found in Windows 95. But our OS/2 test results showed that CPU performance scales to this operating system as it does to Windows NT. In other

continues





correctly estimated the mix of instructions in typical PC applications. The 5K86 design took shortcuts in the way it implemented a few instructions that AMD assumed were infrequently used. In reality, these instructions are used much more than AMD expected, and their slow execution drags down overall performance. The net result is that the first 5K86 chips barely match Pentium performance at a given clock rate, despite their more complex internal design and faster performance on some code sequences.

AMD has also had trouble getting the 5K86 design to run at high clock rates. The first 5K86 chips have a maximum speed of 90 MHz, even though they use a more advanced semiconductor process (manufacturing) technology than Cyrix's 6x86, which runs at up to 133 MHz. AMD uses a more complex design that is intended to do more work in each clock cycle, while Cyrix has a simpler design that enables a higher clock rate. Unfortunately for AMD, so far this tradeoff has been a poor one: AMD is saddled with a design that is limited in clock rate yet does less work in each clock cycle than Cyrix's chip.

ENHANCING THE 5K86

AMD says these problems won't be hard to fix. Its designers are now revising the 5K86 design, adding logic to speed the slow instructions and making a few other refinements to eliminate bottlenecks the designers found after they had a chance to exercise the chip thoroughly. At the same time, the circuitry is being tuned to enable the chip to run at higher clock rates. The

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BENCHMARK TESTS

continued

words, the better performance that the Pentium Pro exhibits under Windows NT is the same that it displays under OS/2.

It was difficult to separate out disk performance. Again, for comparison purposes, we concentrated on the 32MB test results, because they better reflect CPU/memory performance. Bear in mind, however, that the 32MB results still reflect substantial disk I/O.

We tested ColorWorks for OS/2 with six different filters. The All Filters, Graphics State Files, and Pixel Displacement filters had little or no disk I/O with 32MB of RAM and therefore gave the best measurement of CPU/memory subsystem performance. The All Filters test stresses integer performance, but because it is run on a 32-bit operating system, the Pentium Pro systems were the top performers. The MicroFlex-686/P166+ was the fastest 6x86-based system; it also edged out the Pentium/166 comparison system. The Graphics State Files test stresses both integer and floating-point math. Again, the two Pentium Pro systems outran all of the other machines. The Sys machine, however, was able to outperform the Pentium/166 system by 6 percent on this test. Our Pixel Displacement test is FPU-intensive, which clearly gives the advantage to the Pentium Pro workstations as well as to the Gateway P5-166 comparison system with 32MB of RAM. The results here closely tracked the Picture Publisher results under Windows NT. The other filters—Tune Image Color, Coon's Warp, and File Rotate—generate heavy disk I/O, and tests with these filters provide a good measure of system performance.

The Visual Age test also generates heavy disk I/O. Because the disk is the slowest subsystem in a PC, it is no surprise that the HP Vectra XU 6/150 ran this test the quickest: Its HP Seagate Barracuda ST 32550N Fast SCSI-2 hard disk propelled the machine to the fastest completion time.—*Analysis written by Richard Fisco*

How We Tested

We tested all systems with 1GB hard disks or larger and 256K L2 cache. We tested each system under three operating systems: Microsoft Windows 95, Microsoft Windows NT Workstation 3.51, and OS/2 Warp Connect 3.0 (we formatted hard disks using FAT, NTFS, and HPFS, respectively). We tested under Windows 95 with 16MB RAM and each vendor's preinstalled graphics driver for 1,024-by-768 resolution with 256 colors, small fonts. We tested under Windows NT with 32MB and 64MB of RAM using each vendor's preinstalled graphics driver for 800-by-600 resolution with 16.7 million colors, small fonts. We tested under OS/2 with 16MB and 32MB of RAM using each vendor's preinstalled graphics driver for 640-by-480 resolution with 16.7 million colors, small fonts.

Microsoft Windows 95 We used our benchmark test suite **ZD Winstone 96, Version 1.0,** to measure each unit's performance when running typical Windows applications. Winstone 96 measures the time a PC takes to execute a set of scripts that exercise 13 Windows applications.

We used WinBench 96, Version 1.0, to measure graphics, disk, and CPU performance. The **ZD Graphics WinMark 96** score, based on 115 tests of Windows GDI functions, represents the performance of each PC's graphics subsystem. The **ZD Disk WinMark 96** score represents disk-subsystem performance. The **ZD CPUmark$_{16}$** and **ZD CPUmark$_{32}$** scores indicate the speed of the CPU subsystem under 16- and 32-bit Windows operating systems, respectively.

Microsoft Windows NT Workstation 3.51 We used test scripts for seven applications: Microsoft Excel for Windows 95 7.0;

OS/2WARPCONNECT 3.0

	ColorWorks									
	All Filters		Graphics State Files		Pixel Displacement		Tune Image Color		Coon's Warp	
Lower scores represent better performance.	16MB	32MB	16MB	32MB	16MB	32MB	16MB	32MB	32MB	32MB
Bold type denotes first place.	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec	Min:sec
Magitronic Power-CX150 (Cx 6x86-P150+)	4:46	4:01	2:17	1:43	**1:06**	0:27	1:27	1:04	2:35	1:05
SPI Mansfield 6x86 P150+ (IBM 6x86-P150+)	4:43	3:52	2:35	1:40	1:18	0:27	1:23	1:03	2:26	1:17
MicroFlex-686/P166+ (Cx 6x86-P166+)	4:46	3:35	2:29	1:32	1:18	0:24	1:16	0:57	**1:26**	1:16
Sys Performance C166+ (Cx 6x86-P166+)	4:35	4:01	2:29	1:30	1:17	0:24	1:16	0:57	2:29	1:29
Gateway P5-166 (Pentium/166)*	5:27	3:39	2:55	1:36	1:36	0:21	1:12	0:47	2:37	1:21
HP Vectra XU 6/150 (Pentium Pro/150)*	3:09	2:18	**2:12**	1:18	1:09	0:17	1:10	0:50	1:57	1:23
Gateway G6-200 (Pentium Pro/200)*	**3:02**	**1:45**	2:18	**1:00**	1:32	**0:13**	**1:01**	**0:38**	2:51	1:25

* Reported for comparison.
† We did not conduct the Coon's Warp test at 16MB.

result of these efforts—if all goes well—will be a new crop of 5K86 chips in the fall that delivers much higher performance.

In the third quarter, AMD expects to ship a new 100-MHz 5K86, which it believes will earn a P133 rating. No measured benchmark test results have been disclosed, but AMD is standing by its claim that the second-generation 5K86 design will deliver the performance of a Pentium that runs at a clock rate up to 30 percent higher. If it achieves this, AMD's enhanced 5K86 will be competitive with Cyrix's 6x86 at a given clock rate. But AMD is far behind in clock rate, so even if it reaches the per-clock performance goal, it will be hard for AMD to catch Cyrix's performance. By year's end, AMD expects to have a 120-MHz 5K86 with a P150 rating; by then, Cyrix will probably have a 150-MHz 6x86-P200+.

NEXGEN FADES AWAY

Although NexGen was the first company to ship a "586" Pentium competitor, the company was never able to capture much of the market. NexGen's 586 was ha... capped by its unique bus design, requi... special chip sets and motherboards, ... by its lagging performance.

In a deal consummated early this ... AMD bought NexGen. Because of ... delays with the 5K86 design, AMD w... ed to have another source of desig... ensure that it would have profitable ... to build in its big new fab. NexGen's ... was not the attraction, however; it w... design that would have been the Nex... 686 and now will be the new AMD ...

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Microsoft Word for Windows 95 7.0; Adobe Photoshop 3.04; AutoCAD, Release 13 for PCs, C3 Version; Symantec's C++ Compiler for CorelDraw 6.0; and Micrografx's Picture Publisher 6.0.

Our **Microsoft Excel Script** and **Microsoft Word Script** tests are macro-driven and perform a number of common operations using actual data files. Functions such as spell-checking, font changes, queries and deletes, repaginations, and print previews are performed in the Word script, and operations such as recalculations, statistical functions, cuts and pastes, and charting are performed in the Excel script.

Testing under **AutoCAD** exercises a broad range of system functions, including a CPU's integer and floating-point capabilities and disk and video subsystem capabilities. There are three key areas of our AutoCAD test script: opening drawing files (including 2-D and 3-D drawings), performing 2-D manipulations (including entity deletions, entity deletions, undo commands, regens, zooms, and pans), and performing 3-D manipulations (including 3-D–view functions and alterations, utilization of the Hide command, 3-D move operations, and a variety of rendering variations).

Testing under **C Compiler** involves the use of the World Wide Web Consortium (W3C) Reference Library benchmark test, which consists of a set of C-source-code modules, largely platform-independent, which may be used to build World Wide Web servers, clients, and proxies. The W3C library is provided by CERN and contains 1.1 million bytes of software source code. The programs were compiled into a 32-bit DLL library with Version 7.20 of Symantec's C++ development environment running under Windows NT.

Testing in Adobe Photoshop involved the use of two filters. The Gaussian Blur filter blurs a selection by an adjustable amount. This filter adds low-frequency detail and can produce a hazy effect. For our **Gaussian Blur** test, we applied a blur of radius 25. The Lighting Effects filter allows application of up to 16 different light sources on an image; we tested with default spotlight settings. The **Lighting Effects** test stresses floating-point processing capability and is applied to an 18.5MB TIFF image.

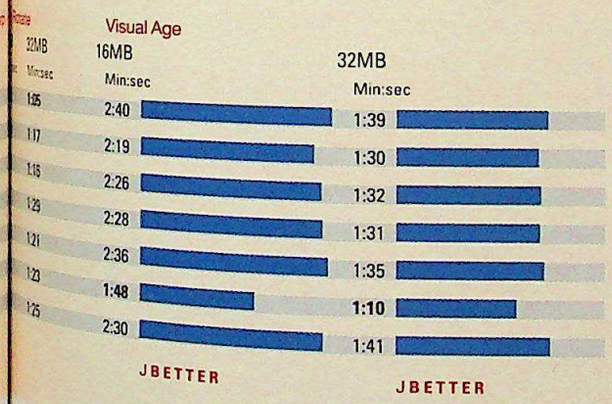
Testing with Micrografx's Picture Publisher involved the use of three filters, each applied to a 16MB test image. In the **Gaussian Blur** test, the Gaussian Blur filter blurs the entire test image, which has a radius of 25. The **Hue Saturation** test involves three tasks: maximizing saturation levels, shifting the hue values 180 degrees, and inverting the colors on the entire image. The **File Rotate** test applies a 347-degree clockwise rotation to the entire test image.

Testing under CorelDraw involved the use of four filters. These filters stress floating-point processing capability. The **Blending Two Objects** test blends two dissimilar textured objects and has 999 steps to the blend, a 360-degree rotation, and a loop. The **Rotating Vector Object** test applies a 15-degree rotation to an object. The **Grouping Vector Object** test arranges the objects within a vector group. The **Extruding Artistic Text** test changes the font size and moves, stretches, and extrudes the font. We tested to a level of 25.

OS/2 Warp Connect 3.0 We used test scripts for two separate applications: ColorWorks for OS/2, Version 1.0, and Visual Age C++ for OS/2, Version 3.0.

Testing under ColorWorks involved the use of six filters. We ran all tests on a 9MB TIFF file. The **All Filters** test applies all available filters (smoothing, sharpen, noise-reduction, and edge-detection filters, along with special filters and custom filters) simultaneously, utilizing integer calculations. The **Graphics State Files** test (which uses both integer and floating-point calculations) loads a GRS file into the test image. The file applies a filter and performs color mapping. The **Pixel Displacement** test (which uses floating-point calculations) displaces pixels and maps the image file. The **Tune Image Color** test changes the color attributes of all pixels, as wel as inverting the color on all pixels (these are integer calculations). Color saturation is maximized, and hue values are shifted 180 degrees (these are floating-point calculations). The **Coon's Warp** test (which utilizes integer calculations) turns the entire image into a masked selection and floats it while applying a particular distortion map to it. We performed this test with 32MB of RAM only, because it will not run properly with 16MB. The **File Rotate** test (which uses integer calculations) takes the entire image, floats it, and rotates it 347 degrees.

Testing under **Visual Age C++** for OS/2 involves the use of the Visual Age compiler to create the target executable VBMAIN.EXE. During compilation, the project is rebuilt, files are recompiled, and resource files are added and linked to produce the executable.



In fact, AMD has recently pulled the plug on the NexGen 586, and the NexGen name will disappear as the company is integrated into AMD. With the 5K86 shipping, supporting the 586 wasn't worthwhile to AMD. The market for the chip was small, and profits were modest.

INTEL'S P55C AND MMX RAISE THE BAR

The game will change in the late fall with the debut of Intel's next-generation Pentium processor, code-named P55C. This chip will mark the debut of Intel's integrated multimedia instruction-set extensions, called MMX. These additions to the venerable *x*86 instruction set, which has remained nearly unchanged since the 386, will significantly boost performance on many audio, graphics, and image-processing applications. The processor will also have larger on-chip caches and other enhancements to boost its performance on all applications—and it will consume less power, making it well suited for portables.

MMX will deliver the most noticeable performance boost in PCs that don't use accelerator chips for multimedia functions but instead depend on the host processor to perform tasks such as video decompression in software. With MMX and a fast processor such as a 200-MHz P55C, for example, it should be possible to decode MPEG-2 video without a hardware decoder chip; without MMX, this is not likely to be possible without compromising quality.

Cyrix's next part is code-named M2. This chip will be based on the 6x86 CPU core but with various enhancements to enable its clock speed to be increased. Cyrix

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First Cyrix 6x86 PCs: How Good? How Fast?

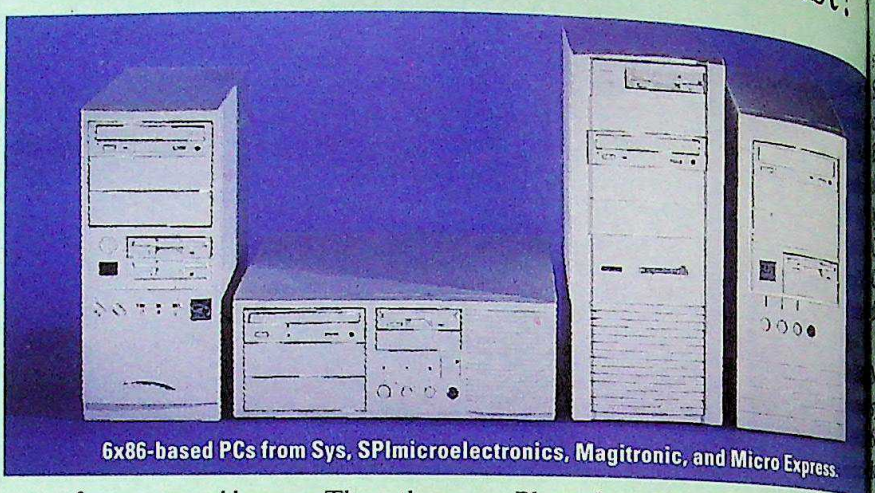
By Cade Metz

Like the archetypal tortoise that beat the hare, Cyrix Corp.'s 6x86 processors outperform their Intel counterparts with cunning rather than quickness. The 120-MHz P150+ and the 133-MHz P166+ run at slower clock speeds than their Pentium competitors, but significant architectural enhancements have produced Winstone 96 scores that rival and even surpass those of the Pentium/150 and the Pentium/166. Although such performance has prompted Cyrix to create its own line of PCs—which should be available by the time you read this—the 6x86 was introduced by an eclectic group of vendors including Magitronic Technology, Micro Express, SPImicroelectronics, and Sys Technology. For this story, we acquired a system from each of these vendors to test their performance relative to that of Pentium PCs under different operating systems.

When the 100-MHz 6x86 processor was announced in October of 1995, Cyrix's in-house tests on the chip produced results that matched those of the Pentium/120, but its 394-mm^2 die size was deemed too bulky for the marketplace. Once Cyrix moved from a three-layer semiconductor manufacturing process to a five-layer-metal process, the chip was shrunk to 204 mm^2 and became an attractive alternative to the Pentium.

The 6x86 incorporates many architectural enhancements made to the Pentium Pro—including out-of-order execution and speculative execution—without abandoning full *x*86 instruction-set compatibility. Consequently, it may outperform Pentium chips running at higher clock speeds, and it is more attuned to a mixed 16- and 32-bit environment than the Pentium Pro.

Cyrix followed the 100-MHz 6x86 with 110-, 120-, and 133-MHz versions of the chip. Along with AMD, IBM, and SGS-Thomson, Cyrix created a new naming convention, called the P-Rating Specification, using Intel's clock speeds to garner the respect of PC manufacturers and buyers. Thus, these chips were dubbed the P133+, P150+, and P166+, while the 100-MHz chip was renamed the P120+.



6x86-based PCs from Sys, SPImicroelectronics, Magitronic, and Micro Express.

SYS PERFORMANCE C166+

Sys Technology's 6x86 machine, the Sys Performance C166+ ($2,699 with Windows 95), goes a long way toward justifying the new P-Rating system. Its Winstone and Graphics WinMark scores were the highest in PC Labs' history—eclipsing the scores of our comparison system, the 166-MHz Gateway P5-166 XL, and the average scores of the 23 Pentium/166 machines tested for our issue of February 20, 1996. On our Disk WinMark 96 tests, the Sys Performance C166+ delivered an impressive score of 1,200, which again topped the scores of both the Gateway comparison system and the average Pentium/166 machine. The machine's $CPUmark_{16}$ and $CPUmark_{32}$ scores were much higher than the average scores in our Pentium/133 roundup of December 5, 1995, but less than the average Pentium/166 results.

Although the Sys PC's scores on our Windows NT- and OS/2-based tests were not as conclusive as those of their Windows 95 counterparts, they still rivaled the scores of the 166-MHz Gateway PC. It handled our Microsoft Excel, AutoCAD, and C++ Compiler scripts significantly faster than the Pentium system but was slightly slower on our tests conducted under Microsoft Word and Adobe Photoshop. Under OS/2, the Sys PC produced mixed results with 32MB of RAM, but it consistently outperformed the Pentium/166 system when configured with 16MB of RAM, thanks to its fast Quantum Fireball hard disk.

The Sys machine we saw was configured with 256K of L2 cache (upgradable to 512K for $50), a 1.2GB hard disk, and a Matrox MGA Millennium graphics card with 2MB of WRAM. The Toshiba 6.7X CD-ROM drive and 15-inch MAG monitor are welcome accoutrements.

MICROFLEX-686/P166+

The first company to bring the 100-MHz 6x86 to market was also the first to introduce a P166+ machine. Although the $2,399 MicroFlex-686/P166+, from Micro Express, did not perform as well as the Sys PC, it still fared better than most Pentium/166 desktops. Like the Sys entry, the MicroFlex unit had 256K of pipelined-burst L2 cache, a 1.2GB hard disk, a Matrox MGA Millennium graphics card with 2MB WRAM, and a 15-inch monitor.

The MicroFlex PC's Winstone, Graphics WinMark, and Disk WinMark scores—which were only slightly behind those of the Sys PC—also topped the marks of both the Gateway comparison machine and most Pentium/166 systems. Again, the $CPUmark_{16}$ and $CPUmark_{32}$ scores fell below the average Pentium/166 scores but eclipsed the average Pentium/133 marks.

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Under Windows NT, the MicroFlex system was consistently slower than the Sys PC, but it was in the same ballpark on every measure except our tests under Excel and AutoCAD. The Sys PC and the Gateway comparison PC were slightly slower than the MicroFlex PC under OS/2 with 32MB of RAM, while the two Cyrix machines equally outperformed the Intel machine with 16MB.

In addition to its P166+ machine, MicroExpress offers P120+ and P150+ systems. Although the MicroFlex-686P166+ doesn't quite offer the performance of the Sys PC, it sells for roughly $300 less and still rivals its faster Intel competitors.

SPI MANSFIELD 6x86-P150+

Although the 6x86 was developed at Cyrix, it is manufactured by IBM Microelectronics, which is selling its own version of the chip under the IBM moniker. The 120-MHz IBM 6x86 is the cornerstone of SPImicroelectronics' SPI Mansfield 6x86-P150+, a $3,929 Windows 95 desktop PC ($3,879 with OS/2) with a 1.2GB hard disk, 256K of L2 cache, a Matrox MGA Millennium graphics card with 2MB of WRAM, a 6X Mitsumi CD-ROM drive, and a 15-inch monitor. This machine not only outperformed the average unit in our Pentium/150 roundup, it also compared well with the average Pentium/166.

Under Windows 95, the Mansfield PC's Winstone, Graphics WinMark, and Disk WinMark scores bested the average Pentium/150 scores as well as the average marks posted in our Pentium/166 roundup. Its scores on our $CPUmark_{16}$ and $CPUmark_{32}$ tests eclipsed those of its average Pentium/150 competitor while barely surpassing the average machine in our Pentium/133 roundup.

As a Windows NT PC, the Mansfield system performed on a par with the MicroFlex-686/P166+ and just beneath the Sys entry. Under OS/2, the Mansfield system tested well on our ColorWorks integer tests at 32MB and extremely well on both of our Visual Age compiler tests.

MAGITRONIC POWER-CX150

Although it used the same chip as the Mansfield PC, albeit with a Cyrix stamp instead of an IBM tag, the Magitronic Power-CX150 produced lower scores. Its performance was still competitive when compared with the average Pentium/150 machine. This $3,200 system offers 256K of L2 cache, a 1.6GB hard disk, an S3 Trio64V+ graphics card with 1MB of DRAM, a 15-inch monitor, and a 4X Toshiba CD-ROM drive.

The Magitronic unit barely edged out the Pentium/150 average on our Winstone, Graphics WinMark, and Disk WinMark tests. We suspect the unit is less optimized than the Mansfield PC. Also, its hard disk is not as fast as those used by other systems, and its graphics card has only 1MB of DRAM. Still, its $CPUmark_{16}$ and $CPUmark_{32}$ scores were better than the Mansfield PC's marks, as well as those of the average Pentium/133 system. With the exceptions of its poor timings on our tests under Word and Excel, the Magitronic produced Windows NT scores that were just below those of its SPI counterpart. Under OS/2, it performed much better than the Mansfield unit with 16MB of RAM, but it faltered with 32MB.

The Magitronic unit combines this performance with an impressive software suite, which includes the 1996 Grolier Multimedia Encyclopedia, Lotus SmartSuite 96, and Novell's PerfectWorks. Ironically, the Magitronic and its P150+ sibling, the SPI Mansfield 6x86-P150+, have steeper price tags than the two P166+ systems and are priced higher than most Pentium/150 machines.

CYRIX'S FUTURE

Belying clock speeds has not only allowed Cyrix to compete with the Pentium but has also led it to supplement these 6x86-based machines with its own line of PCs. As these machines begin to roll out, the 6x86 will continue to evolve. And IBM will have some company as SGS-Thomson also begins to manufacture the chip.

also promises to have multimedia instruction-set extensions in the M2, but it remains to be seen whether they will be Cyrix's own version or Intel-compatible.

AMD's next-generation part is codenamed K6 and is likely to be marketed as the AMD 6K86. AMD plans to have multimedia extensions in the K6, and a recent cross-licensing agreement between Intel and AMD suggests that AMD will make the K6 Intel MMX-compatible.

THE ALTERNATIVES IN PERSPECTIVE

Cyrix (with its partners IBM Microelectronics and SGS-Thomson) has a strong offering to compete with high-end Pentium processors. AMD will be limited to the low end for at least the next six months, and it is too early to pass judgment on the company's position after that.

No matter how strong competitive products may be, the business reality is that Pentium competitors can take only a modest amount of market share. Intel has the manufacturing capacity and technology to stay on top. But in a market this large, a number-two and even a number-three position can be very profitable.

With the combined manufacturing capacity and marketing efforts of IBM Microelectronics and SGS-Thomson, as well as Cyrix's own marketing and sales efforts, Cyrix hopes to capture 10 percent of the Pentium market—which would be about 6 million chips this year—with the 6x86. This is an aggressive goal but not beyond the realm of possibility.

AMD has grander ambitions but is farther from realizing them. The company has set a goal of more than 30 percent market share, but this will be a long time coming. This year, AMD expects to ship about 3 million 5K86 processors—about 5 percent of the market. AMD is pushing hard to improve its position dramatically in 1997, but Cyrix and its partners, thanks to their superior product execution, now have a shot at unseating AMD as the number-two supplier of microprocessors.

For PC buyers, Pentium alternatives are likely to offer good value as PC makers pass on some of the savings in chip cost. In some cases, such as Cyrix's 6x86-P166+, the alternatives will offer leading-edge performance, but this benefit won't hold true across all applications and will be difficult to maintain in the long run. □

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JOHN C. DVORAK

Why Microsoft Will Beat Netscape

The writing is on the wall for anyone who wants to read it. Microsoft will beat Netscape in the Web-browser battle. All you Webmasters out there who are putting "best when viewed with Netscape Navigator" links on your Web pages had better reconsider. Several recent incidents have convinced me that Netscape is fast approaching the end of the road.

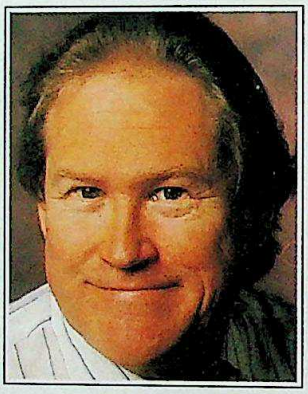
The first inkling I had of this was when a friend of mine, who is definitely in the know, installed Internet Explorer on his Macintosh before Netscape had shipped Version 2.0 for the Mac. When I asked him why, he said he believed Microsoft had won the battle. Initially, I thought this was amusing because Netscape has 80 percent of the market. But apparently he was impressed with the speed at which Microsoft had moved to the Macintosh platform. And his comment seemed significant in the light of his dislike of Microsoft.

Then came the America Online fiasco. Netscape made a huge announcement about how AOL would use Navigator as the browser for its GNN Internet service. Hoopla ensued. Analysts hailed the joint venture, predicting that it would cement Netscape's frontrunner status. A day later, Microsoft waded in and quickly stole the spotlight. Suddenly, AOL had agreed to make Explorer the primary browser for the 5 million-plus subscribers of its online service. In exchange, AOL secured a place on the Windows 95 desktop.

Microsoft has made the biggest about-face for a large company by pulling the plug on MSN, its online service, and recasting it as an Internet-access provider. Following Netscape's lead, Microsoft has said Internet Explorer will always be free. Microsoft's browser will be bundled with all versions of Windows, including Windows NT. What is Netscape going to do against this onslaught? What *can* it do?

Nothing, and the irony of this is that Netscape has no clue this is even happening. The company has never competed with the likes of Microsoft. Most members of the Netscape team are Unix retreads and workstation geeks with no connection to low-end computing. And they have few allies in the desktop world. Most people who deal with Netscape remark about the incredible arrogance of its personnel, "worse than Microsoft ever was," they say.

You get the sense that anyone ever involved with Netscape would love to see Microsoft humiliate the company, myself included. Don't get me wrong, I'm no Microsoft booster. But I recently had the unfortunate displeasure of meeting Jim Barksdale, Netscape's CEO, for a panel discussion, and I was shocked by his unwillingness even to chat. On the panel, he managed to insult the moderator, who was with *Forbes* magazine, while complaining about what a poor job Netscape does with the media. Afterwards, he became upset, because a limo wasn't waiting curbside to take him to the airport. Nevertheless, he refused an offer of a ride in a plain old car, instead preferring to wait for the limo.



NETSCAPE'S D-DAY

What is Netscape going to do against this onslaught? What can it do? Nothing.

Netscape is one of a handful of Silicon Valley companies, led by Sun Microsystems, that suffer from the delusion that Microsoft is just an aberration. According to this notion, all it will take is a swift kick from the old minicomputer hacks to stamp out Microsoft for good. Remember that Jim Clark, chairman of Netscape, hails from Silicon Graphics, another workstation company with no experience in the low-end market.

The spiritual leader of this group, though, has to be Sun CEO Scott McNealy, who brags about being the biggest Microsoft basher. As a result, one of the great hardware design and manufacturing companies continues to focus on software for no apparent reason. This has led to the misguided belief that a Java word processor with five functions will somehow dethrone Microsoft Word because it's free. Let me tell you guys something: Nobody has ever stood up and ridiculed Microsoft without paying a heavy price.

The same forces are at play within Netscape. I trace it to the fact that both Netscape and Sun are backed by the same group of high-tech venture capitalists, a small clique of friends who seldom leave the comfort of their limos.

Of course, the whole thing may be cosmic. I've always had a feeling people get into a dangerous comfort zone in business. Perhaps Jim Clark's destiny is to make a good product but always be second best. Maybe Netscape will be content to be number two to Microsoft. There is no doubt in my mind that this is exactly where the company is heading.

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Kinder, Gentler DATABASES

Good news: These end-user databases harness estimable power under a host of wizards, genies, templates, and pre-built forms that make databases accessible tools for everyone.

By Joe Salemi

End-user databases, once thought of as simple mailing-list managers, have turned into powerful but friendly tools for managing the complex data needs of both individual users and entire organizations.

Windows 95 has significantly affected the market. In some products, such as Microsoft Access, 32-bit support has increased performance. Access also takes advantage of Windows 95's improved 32-bit OLE and built-in replication capabilities (using the Briefcase feature). All the products reviewed here, except for OS/2-based DBExpert, are Windows products, and some are specific to Windows 95. And all the products are new or have upgraded since our last roundup.

What exactly do we define as an end-user database? Years ago they were called non-programmable databases, which doesn't quite fit any more since most (though not all) of these products provide some programming capabilities. The best way to describe these products is af-

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fordable (under $500) and able to help users of any experience level create sophisticated data-handling applications without programming. End-user databases provide a wide variety of built-in features such as wizards, templates, and sometimes complete application generators that help even novice users create databases to suit a variety of needs.

On the other hand, developer-oriented databases require programming experience, which often means *building* many of the database elements that end-user databases create automatically. The sidebar "When Wizards Aren't Enough" discusses some developer-oriented databases. You'll also find information about third-party add-ons for the end-user databases in the sidebar "End-User Database Add-Ons."

Vendors have realized that users need a simpler way to connect to organization-wide databases.

Since our last database evaluation, ease-of-use and automation features have advanced the most. Chief among them are database helpers, or wizards, that guide you through the process of creating database files, forms, reports, and—in some cases—the final application.

MAKING IT SIMPLE

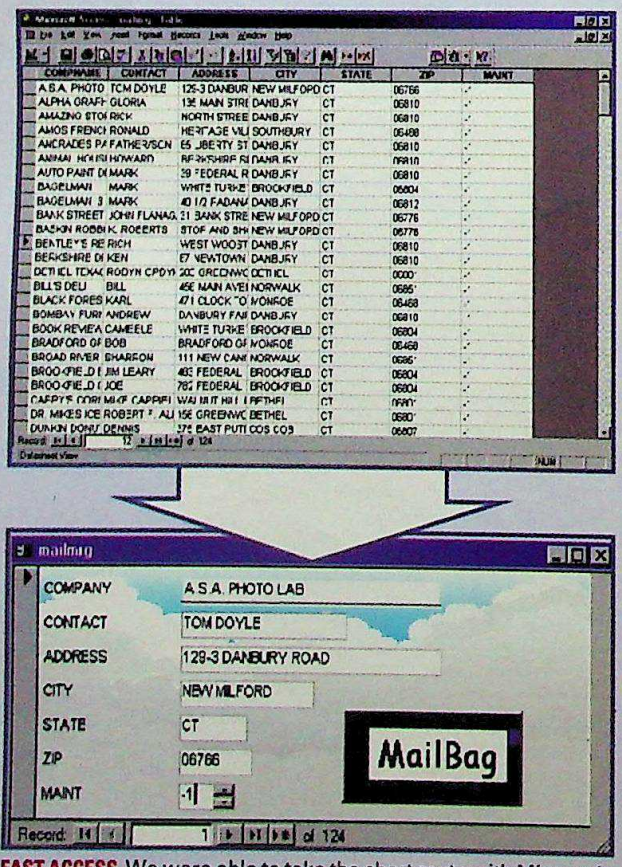
Database vendors have also realized that users need a simpler way to connect to organization-wide databases; consequently, they've provided enhanced connectivity to other database types, particularly to database servers. Most have joined Microsoft in supporting the Open Database Connections (ODBC) standard, which has emerged as the standard method for connecting to client-server databases. We've also seen increased support for Structured Query Language (SQL) as a native query language.

Many of these products have also

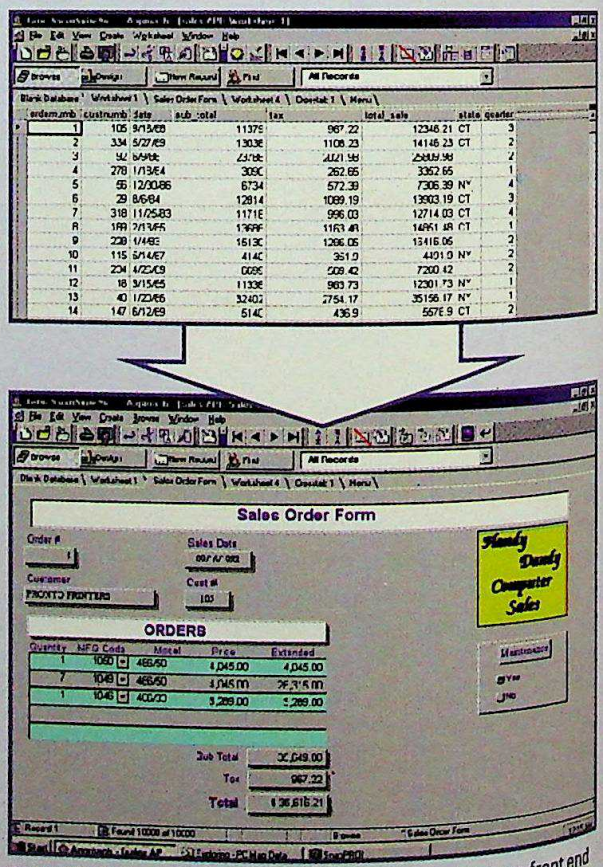
HIGHLIGHTS

Database Building Blocks

You may not be a programmer, but you'll look like one if you experiment with the wizards and templates found in today's end-user databases.



FAST ACCESS We were able to take the short route with Microsoft Access: With the Microsoft New Database Wizard, we readily accepted most of Access's defaults and quickly turned this complex table of information (above) into our simple but effective Mailbag interface (below).



GOOD APPROACH Though we could create a simple database front end just as easily with Lotus Approach as we did with Access, we decided to spend considerably more time tweaking the Lotus Approach template to build this application. Using tabs (all of which can be locked or hidden), you can gain quick access to the core data (above).

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improved their own data-handling capabilities to make it easier to create multitable relational databases and to incorporate graphics and other objects into the database.

In addition to the improved performance we've seen under Windows 95, database applications are making use of Windows 95's enhanced OLE to create sophisticated links between them and other Windows applications. Approach, for example, can act as an OLE container and server, so it can easily integrate a database with spreadsheets and documents.

Windows 95 also provides a built-in database replication mechanism: the Briefcase. While only Access explicitly supports it, any of the Windows 95–compliant products can use it to ensure that changes to one database are replicated to other copies on laptops or on other network servers.

DISCOVERY

We've found a suprisingly broad range of features and capabilities in these database packages. Though most guide you quickly and easily through the application development, others—like FileMaker Pro, RBASE, and Wall Data's Salsa—take a more hands-off approach. Instead of wizards, they provide templates that you can use to create predefined databases, forms, and reports.

As organizations integrate standalone databases into enterprise-wide database systems, inter-database connectivity is becoming increasingly important. Some vendors have already begun addressing this, including Claris, whose FileMaker Pro has support for Macintosh databases, and Lotus, whose Approach has support for native dBase file formats (including Notes). However, none of these products let you produce standalone runtime versions, though some manufacturers sell add-ons that accomplish this task.

The big unknown is how the expansion of the Internet, and particularly the World Wide Web, will affect this class of products. Some vendors are working toward integrating their products seamlessly into the Web and providing sophisticated look-up capabilities via the Internet. For example, Approach includes Web browser capabilities that will automatically connect you to a site listed in a database.

Though this future may appear daunting to the uninitiated, those who do choose one of the products examined here should eventually find the possibilities exciting.

Our Contributors: GREGORY ALWANG and TODD E. COLUMB are contributors to *PC Magazine*. RICHARD V. DRAGAN is a programmer for *PC Magazine*. STEPHEN W. PLAIN and JOE SALEMI are contributing editors of *PC Magazine*. DAN SMITH was the project leader, and LANCE N. ULANOFF was the senior associate editor in charge of this story.

Lotus Approach 96 Edition
Microsoft Access for Windows 95

"Scary," "boring," and "unmanageable" are all words we've heard end users attribute to databases. Vendors heard them too, and responded. Two products in particular are transforming the end-user database market: Microsoft Access for Windows 95 and Lotus Approach 96 Edition.

If there's an effective database product that surpasses all others in ease of use, it's Lotus Approach 96. About a third of the price of Microsoft Access, Approach makes excellent use of a tabbed interface design, giving you instant access to your forms, data worksheets, crosstabs, and reports.

Those familiar with Lotus's other products will find the same floating InfoBox. It lets you access and alter properties for forms, fields, or any object in your database on the fly. And a nifty Fast Format icon lets you quickly duplicate attributes across multiple objects. Approach has the power to take end users to the next level with Lotus's LotusScript programming language.

Microsoft Access is the most powerful end-use database product available today, and it's nearly as accessible as Approach. Wizards shield end users from much of the product's complexity. To help new users get into databases, Access maintains a rigid distinction between tables and forms, and it keeps all the parts of your database in a single easy-to-manage file.

PC MAGAZINE EDITORS' CHOICE

No product takes better advantage of Windows 95. Access can keep multiple versions of your database (the one on your desktop, the one on your laptop) in synch via Windows 95's Briefcase feature.

Make no mistake about it: A lot of power rumbles under this friendly surface. Access can grow with your abilities, all the way up to database *programming* with Visual Basic for Applications. One important caveat: Access requires at least 12MB of RAM, and we found that it takes 16MB to make the interface fly.

Alpha Software Corp.

Alpha Five

At $49.95, Alpha Five 2, from Alpha Software Corp., is an undeniable bargain. With its extensive field rules, strong reporting, Genies (wizards), and more than 35 templates, you can create databases and full applications effortlessly and rapidly. A 32-bit Windows 95 application, Alpha Five will probably support Windows NT by the time you read this.

Alpha Five uses .DBF as its native file format. While it's fully compatible with a wide range of file formats, Alpha Five doesn't support SQL or ODBC. But the program's well-crafted, easy-to-use interface will appeal to new users, despite the interface's occasional inability to memorize the size and placement

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END-USER DATABASES

How to Read the Suitability to Task Boxes

In this evaluation of end-user databases, we rate each database in six tasks typical to an end user. Where applicable, templates or wizards were used to automate the process. All tasks are rated for power and ease of use.

For our **general database** task, we look at how each database product creates new tables, interacts with existing data and structures, and imports records from an existing source.

Our **forms** task rates each database application on its ability to create a set of data entry screens. Accordingly, we take into account query design mechanisms, form generators, and templates.

SUITABILITY TO TASK

Product name	Power Excellent	Ease Excellent
General database		
Forms	Excellent	Excellent
Query and analysis	Good	Good
Reporting	Fair	Fair
Rapid application development	Poor	Poor
Connectivity	N/A	N/A

The **query and analysis** task looks at the database's ability to help end users formulate simple or complex queries.

In the **reporting** task, we evaluate the product's ability to create billing statements, sales reports, mailing labels, and external and internal mail merges from the data set. We also evaluate analytical tools such as crosstabs and charts.

The **rapid application development** (RAD) task tests how well each end-user database package can quickly and efficiently build a front end that integrates the data and various features of a program into an application.

We also evaluate the **connectivity** features for each end-user database package, which include accessing data across a network as well as accessing data from a SQL Server.

of dialog boxes within forms.

Alpha Five's New Object Genie guides you through the necessary steps to create a table. You can choose one of the program's templates, which include predefined field rules, forms, and reports. This lets you build simple but complete applications. Besides the standard field types, you can also create .BMP, OLE, and Rich Text Memo fields.

The program's extensive field rule options include validations, masks, lookups, postings, and some esoteric field rules such as double entry (which automatically requires the user to enter the data twice). Calculated validations can include a built-in function, for example, that validates credit card numbers. You can also create auto-increments for numeric, data, *and* text fields. In addition, Alpha Five's powerful posting rules allow you to post data conditionally from one field to another in any table (related or not). Many of the rules, including postings, offer custom settings as well.

DATA FOX

Alpha Five adeptly employs the FoxPro index format. When you define an index (the program doesn't create an index automatically), you can select multiple fields; simply select numeric fields and Alpha Five automatically inserts an appropriate STR() function. You can also specify a primary index and rebuild all indexes with one mouse click.

Establishing relations also requires little expertise. The New Object Genie expertly guides you through the task of creating a set of related tables. After you select the tables and link fields, Alpha Five displays the relations graphically. You can add more relations to the main table or related tables. Alpha Five creates a default form for each table and set. The default form for a set even includes the child records in scrollable tables, a nice touch that saves you design time later on.

The New Object Genie also provides step-by-step help for creating new forms. You can use the default form as a starting point for your own custom form. Alpha Five enforces any predefined field rules wherever the field is in use (in forms, browses, and so forth). Like Microsoft's Access, Alpha Five has the invaluable, time-saving ability to define field masks, templates, validations, and lookups at the table level.

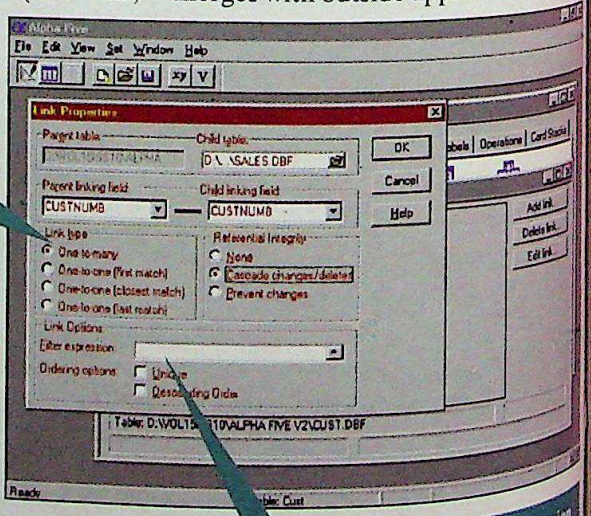
CUSTOM MENUS

You can create custom menus by attaching a form to any table in a database and setting it to open automatically whenever you load that database.

You can also build buttons that open other forms or perform database operations. One report option lets you decide whether to use the current order and filter or to specify a new order.

Alpha Five easily performs queries with its Query by Form, Query by Table, "find text" and "find by" keys, or optimized queries. Alpha Five conducts sorting with either an index or a "quick sort" or as part of a query.

Alpha Five supports custom reports, labels, and form letters, but not charts. You can create labels using Alpha Five's library of Avery and NEBS label formats. You can also perform internal mail-merges or export your data for mail-merges with outside applications.



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Why ZD's PC Benchmark Team, and Not PC WorldBench, sets the standard for the Industry

○ Winstone 32 and Winstone 96 provide a complete team that runs a total of 21 business applications. Winstone 32 includes eight 32-bit business applications from five different vendors. Winstone 96 includes 13 16-bit business applications from six different vendors.	○ PC WorldBench uses only three 16-bit applications and three 32-bit applications from a total of four different vendors. All three of the 32-applications PC WorldBench uses are from a single vendor (Microsoft).
○ ZD's PC Benchmarks CD-ROM which contains Winstone 32, Winstone 96, and WinBench 96 includes everything you need to run the benchmark programs, including the applications Winstone 96 runs during a test.	○ With PC WorldBench, you have to own or buy the necessary applications and install them yourself.
○ Winstone 32 produces an overall score for the PC regardless of the application software installed.	○ With PC WorldBench, if the test PC does not contain all the necessary applications, you can't get an overall score.
○ With Winstone 32 or Winstone 96, if you want more information on why a system performs as it does or if you notice an anomaly or a problem with a system. WinBench 96's subsystem tests can help you find the particular component causing the problem.	○ PC WorldBench provides only applications and overall scores for a PC: it does not provide any subsystem-level tests. Thus, you have no way to go more technical information on a systems performance or investigate problems its experiencing.
○ You don't have to do any special application setup to run Winstone 32. With both Winstone 32 and Winstone 96, the installation and setup programs do everything for you. So, you can count on accurate and repeatable results, because the applications Winstone 32 and Winstone 96 run will be set up the same way on each test system.	○ With PC WorldBench, you have no way of knowing how the *PC World* Test Center set up applications on its test systems for its reviews. Even if you have the necessary applications to run the program installed on the test system, you can't guarantee that the setup of these applications matches the *PC World* Test Center's setup. Thus, you won't be able to accurately compare your scores with scores *PC World* has published.
○ To determine which applications to use in both Winstone 32 and Winstone 96, ZD consulted with Computer Intelligence InfoCorp (CII), a leading market research company (and another division of ZD). We chose the business applications that were the market leaders and were available when our development on these benchmark programs began. For Winstone 32, we similarly determined the 32-bit business application market leaders.	○ In their press release and articles regarding PC WorldBench, *PC World* did not disclose how they chose the applications the benchmark program uses.
○ Multiple ZD publications around the world use the PC benchmark testing team to measure PC performance.	○ Only one publication, *PC World*, uses PC WorldBench.
○ ZD publications review hundreds of machines using Winstone 32 and other ZD PC benchmarks for their comparative reviews. *PC Magazine* alone reviewed 101 machines for their Spring COMDEX issue.	○ *PC World* reviewed 20 machines for their PC WorldBench debut issue in March.

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SUITABILITY TO TASK		
Alpha Five		
	Power	Ease
General database	Good	Good
Forms	Good	Good
Query and analysis	Good	Good
Reporting	Good	Good
Rapid application development	Fair	Good
Connectivity	Fair	Good

All custom databases can be shared over the LAN, and Alpha Five's support for concurrent users is limited only by your network's abilities. And though all networked users need their own copies of the product, Alpha Five's three-user pack ($70) costs less than most other products' *additional* licenses.

In this version of Alpha Five, you won't find extensive macro or scripting capabilities. But look for a full-featured developers' version, which uses Visual Basic–like syntax, scheduled for release this summer.

A competent end-user database, Alpha Five 2 impressed us with its powerful field rules and full relational support. On the other hand, its lack of SQL and ODBC support as well as a couple of frustrating interface flaws may discourage some users.—*Todd E. Columb*

Alpha Five 2. Estimated street price: $49.95. Requires: 486-based PC or better, 12MB RAM, 15MB hard disk space, Microsoft Windows 95. Alpha Software Corp., Burlington, MA; http://www.alphasoftware.com.

(No Indian partner.)

DataEase International Inc.

DataEase for Windows

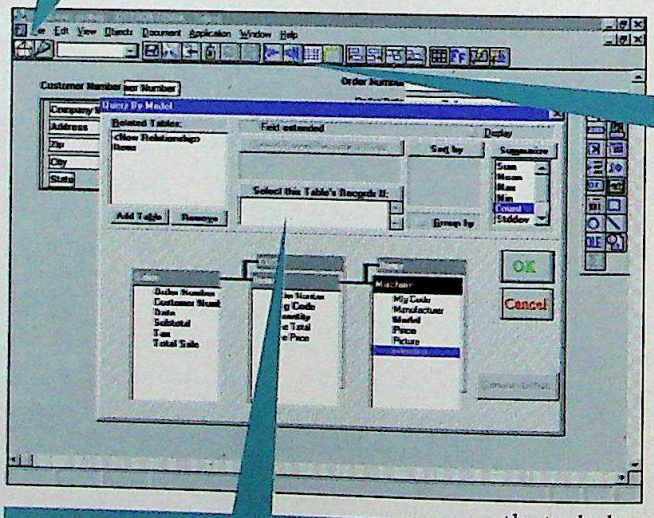
DataEase 5.11 for Windows ($495) is an ineffective migration of the company's veteran DOS database product. Although designed for both end users and longtime developers of DataEase for DOS, the 16-bit Windows product is far from user-friendly. DataEase exhibited a less productive environment than that found in most of the other databases we tested, and it required coding for even the simplest tasks in our testing script. DataEase uses its own proprietary format but can access AS/400, dBASE, DB2, Oracle, Paradox, SQL Server, and Sybase formats via ODBC if you provide the appropriate drivers.

DataEase's consistent toolbars emerge as the product's most welcoming feature. You can instantly switch between Design and User views to test your changes immediately. When you open or create an application, DataEase presents the Catalog, a container window of the application's Tables, Menus, Forms, Reports, and Procedures. DataEase blurs the distinction between forms and tables by eliminating the usual step of defining tables before using them for forms. When you create a new form, the program creates the table automatically as you place fields on the form, and when you draw a new field, the field definition window appears.

FIELD WORK

The field definition window lets you define all of a field's characteristics, such as type, length, index settings, security, display characteristics, derivation formula (if it's a calculated field), validation formula, and custom help messages. Though efficient at times, often this compact all-in-one dialog made us search in vain for ways to restrict data without coding. For example, to restrict a state field to two alphabetic characters, we had to write a validation formula to test each character for a range from A to Z. And because DataEase's date format is global to the entire product, we couldn't change the display format for date fields.

In DataEase for Windows, you can quickly switch between User and Design views by clicking the appropriate toolbar buttons.



One of DataEase's most notable features is its gradual zoom feature. You can zoom in and out from your forms and reports in both Design and User views.

The Query by Model dialog lets you quickly build multiple table forms and reports through point and click.

DATA UNEASE

We ran into our first stability problem with the product when we imported data into our customer table. The product crashed on us several times as we switched between Design view and User view to browse our table. We determined that this was related to the size of the memo field we defined, and the vendor confirmed this as a reported bug. Our problems with this memo field were not yet over, however; when we imported from a dBASE table, the memo field incorrectly read the data. The vendor also confirmed this bug, so we finally resorted to importing from a text file.

We used the product's Query By Model interface to define our multitable forms and reports. Query By Model is DataEase's query builder that lets you pick tables and fields, define sorting and grouping, and establish summary calculations by pointing and clicking. This dialog is easy to use but we found the Expression Builder—the pop-up window that lets you create selection and filter formulas—weak at syntax checking.

While DataEase helped us get started with our multitable forms, it did little to help us finish them. The product lays out the various subforms and groupings with thin boxes. We had great difficulty positioning these boxes and the fields they contained, especially when we attempted to align fields from separate groups. Our sales order form presented the biggest stumbling block. While most products allowed us to simply multiply the quantity field from our items table with the price field of our products table to create line totals, DataEase refused to coop-

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create. According to technical support, you must define a virtual field for one table with a lookup formula to the other.

We ran into similar layout problems with our reports and experienced some unexpected results. Although the product includes a WYSIWYG report and form designer, the vertical lines in our printed reports were erratically spaced.

NO GRAPHING

DataEase does include different styles of reports, including free-form, banded, columnar, and mailing labels. However, the product lacks a functional graphing

SUITABILITY TO TASK

DataEase for Windows

	Power	Ease
General database	Fair	Fair
Forms	Fair	Fair
Query and analysis	Fair	Good
Reporting	Fair	Fair
Rapid application development	Good	Fair
Connectivity	Good	Good

feature (though the documentation and menu items claim otherwise) as well as crosstab support. DataEase explained that the graphing feature was recently removed because it was buggy. We had no problem creating mailing labels or basic tabular reports, but our progress slowed down tremendously when we moved on to our billing statement—a report that required some summarization, conditional text, and precise formatting. Again, we had to resort to coding several formulas.

DataEase for Windows has not progressed much since its short-lived predecessor, DataEase Express for Windows, moved the company's established program into Windows. The product still seems unfinished and unrefined, and its underlying scripting language is not event-driven, so it can't merge well with the event-driven Windows environment. In its current state, DataEase for Windows simply can't compete with the leading end-user databases.—*Stephen W. Plain*

DataEase 5.11 for Windows. List price: $495. Requires: 386-based PC or better, 4MB RAM, 10MB hard disk space, Windows 3.1 or later. DataEase International Inc., Trumbull, CT.

(No Indian partner.)

Designer Software Inc.

DBExpert

Designer Software's DBExpert 2.0 ($149) provides an easy-to-use interface and good connectivity to multiple database sources, presenting an appealing database solution for small business users working in OS/2.

DBExpert uses a central object manager window and an OS/2 notebook control to organize all the elements in your database application. Clicking on the Tables tab brings up a list of available tables or allows you to create new tables in your database. Fields supported include Text, Memo, Number, Counter, and Bitmap. As you create tables, DBExpert searches the other tables in your database for matching field names and forces you to use the same data types when creating links between tables.

The default database type in DBExpert is the dBASE IV .DBF file format using ODBC. For better performance, native non-ODBC access is available for connecting to standard DB/2 databases. DBExpert lets you combine database types within the same applications and view local and remote tables side-by-side. You can also import and export .CSV and dBASE IV files, though importing more than 1,000 records at the same time proved very sluggish—DBExpert performed third from last in almost all our tests.

SUITABILITY TO TASK

DBExpert

	Power	Ease
General database	Good	Good
Forms	Good	Good
Query and analysis	Good	Excellent
Reporting	Good	Good
Rapid application development	Good	Good
Connectivity	Fair	Good

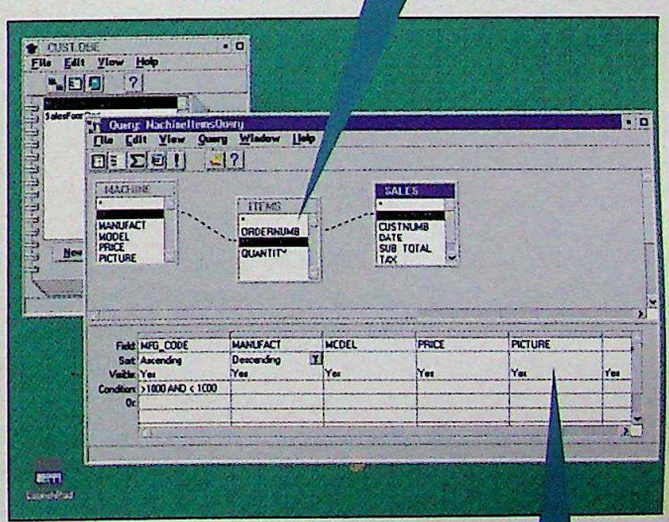
BUILD A QUESTION

The Query Designer tool in DBExpert, which looks and works like Microsoft Access's Query, is one of DBExpert's most appealing features. The Query Designer gives you excellent control, letting you add tables and columns interactively using the mouse. Just double click columns to add them to a spreadsheet. In addition, you can join tables by dragging a field from one table to another field in another table, and you can choose sorting conditions, as well as calculated and total fields.

To create views, forms, and reports you first design queries. DBExpert's view module is also a winning feature. Once you create and open a view, you can add and edit records in spreadsheet format search for values using full and partial matches, and perform mass updates on entire columns. For example, we effortlessly browsed a query with 50,000 records.

DBExpert lets you easily convert a query into a form with its Quick Form option. The interface for the form designer also resembles that found in other packages. You can add and arrange controls including bitmaps, simple bar charts, pies and line graphs within forms. Validation rules for data, such as range checking and formatting options, are easily added by changing the settings for each field. You also can attach code to events for a particular control, such as entering and leaving a field. But to add detail records to a master view, you need to embed one form within another form, and join them on a field—not an easy task for inexperienced users

DBExpert lets you connect tables visually and double-click to choose fields to your query.



You add sorting and data selection criteria in this table-like form.

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PERFORMANCE TESTS

End-User Databases

PC MAGAZINE LABS

In general, Microsoft Access and Microrim's R:BASE's database engines outperformed most competitors. On the other hand, Wall Data Corp.'s Salsa was quite slow, and Claris's FileMaker Pro kept up with the other databases when querying indexed fields but did poorly on all tests involving nonindexed fields.

What the Numbers Mean

To examine the performance of the nine end-user database products, we created five tests: filter on an indexed field, filter on a nonindexed field, update on an indexed field, update on a nonindexed field, and auto report.

Our **Filter on an Indexed Field** test measured how quickly each package searched on an indexed field within a 61,441-row table based on a specific selection criteria that returned 1,054 records. Our **Filter on a Nonindexed Field** test queried the same table on an unindexed numeric field that returned 19 records.

In our **Update on an Indexed Field,** we queried the 61,441 record table based on the value of two fields that modified 83 records: the key field and a nonindexed field. The key field in the result set is then updated. Wherever possible, we attempted to perform the query and update in a single step. In a few cases, we had to first perform the query and then run an update. Our **Update on a Nonindexed Field** test queried a single nonindexed numeric field and updated this field in the resulting query set, modifying 63 records.

Finally, our **Auto-Report** test measured how quickly the database could generate a standard columnar report that returned 63 records. To produce the report, the package must return a subset of the data based upon a joining of two tables on a key value. The results are then printed to a file on the workstation. Most of the products performed the query and report in a single step, but a few programs required that the query set be performed first. Then they generated the report from that set; in these cases we combined the time of the query and the report.

Microsoft Access performed quickly with 8MB of RAM. (Since Microsoft Access's literature states that it *requires* 12MB of RAM, we also tested under that configuration. Its database engine performance was slightly better than it was with 8MB, and the application's responsiveness was vastly improved.) But while the queries and reports produced reasonably fast results under 8MB, the overall performance of the product, such as the time to bring up dialog boxes or to walk through Wizards, was intolerably slow.

As expected, Lotus Approach 96's nonindexed searches were noticeably slower than its indexed searches. However, Approach's SmartIndexing feature creates an index the first time you query an unindexed field. Therefore, all subsequent queries on the field will be considerably faster. Although the size of the files may increase substantially, most users probably won't mind, and the benefits of indexing these fields will likely outweigh the risks. For our testing purposes, we deleted the index created by Approach before re-running the test.

Although we ran the two 16-bit applications, DataEase and Salsa, under Windows 95, neither took advantage of Windows 95's enhancements. In fact, on our update on a nonindexed field test, DataEase's and Salsa's performance worsened under Windows 95: When querying fields that are unindexed, DataEase creates a temporary index on that unindexed field, which can lead to high overhead. In Salsa's case, it assumes that you plan to modify the data and pre-processes all records. Under Windows 95, both these programs suffer from slow input/output (I/O) operations. But both products do benefit from Windows 95's print spooler.

DBExpert, the only OS/2 database in this roundup, performs below average in all our tests, compared to the other packages. Although all query operations are threaded, if the field is nonindexed, DBExpert has to scan the entire table to filter the fields that are indexed. In DBExpert, the tests for filter on a nonindexed field, update on an indexed field, and update on a nonindexed field required the resulting set to come from either an unindexed field or both indexed and unindexed fields. DBExpert's performance in indexed fields was significantly faster than the nonindexed tests. But compared with its competition, DBExpert's indexed operations performed poorly (probably because of OS/2's overhead).

For our update on an indexed field test, we couldn't test Salsa because it can only search and replace based on a single field, and our tests queried on two fields. In addition, Salsa requires constant toggling back and forth between the various modules of the product to refine the application design. Although Salsa's interface exhibited a fresh concept in the database market, the program's limitations make it unacceptable for actual database use on anything but a fast Pentium with at least 16MB of RAM (a

The report designer in DBExpert gets good marks for ease of use, at least for simple report types. For one thing, you can reuse views as reports (though you'll probably need to customize them further). Although DBExpert doesn't reference Avery label types by number, it supports common label sizes and can define custom label sizes. You can also print preview and easily add fields, graphs, calculated fields and totals, as well as detail records. However, more advanced reporting, such as crosstabs, requires some programming. The product also lacks a built-in mail-merge capability.

For more advanced development, DBExpert uses OS/2's powerful REXX programming language along with approximately 100 functions that let you perform database functions from within your code. You can attach macro code to a variety of form and control events, so that processing can occur before and after edits or record updates, for instance. Unfortunately, DBExpert doesn't let you change or design custom OS/2 menus, so you'll probably resort to creating buttons to simulate menu choices.

The well-written manual that accompanies DBExpert offers a simple introduction to the product, including how to get the most out of REXX. The easy-to-read tutorial book guides you carefully through the design of your first database, so that it's up

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system on which we did not test). Salsa also won't return more than 16,000 rows at one time, although our tests didn't exercise this limitation.

Although tests on indexed fields in Paradox produced average results, performance deteriorated when any query depended on a secondary index: R:BASE led the pack in our auto report test: It prepares the data internally with its proprietary engine and then processes the data to a Windows print job on a band-by-band basis. DataEase also accomplished this task exceptionally well, using standard Windows API calls to the print spooler.

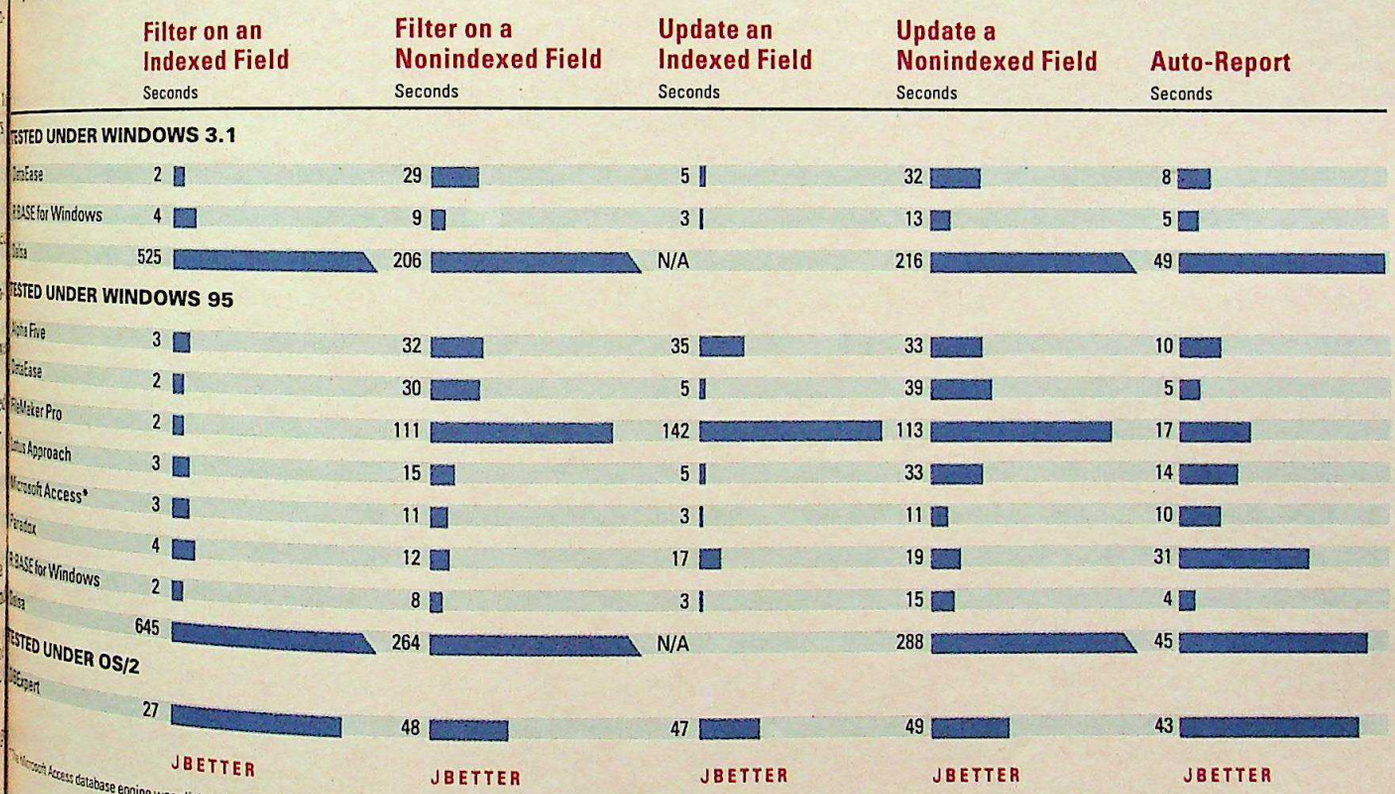
How We Tested

The data in our end-user database tests consisted of a subset of the Consumer Price Index (CPI) called All Urban Consumers. We retrieved the data from the Bureau of Labor Statistics' Web page at http://www.bls.gov, where it is available in a form ideally suited for such testing. Most of it is actual CPI data in time series form identified by a mnemonic, and other databases are available for decoding those mnemonics. The data set consisted of five interrelated tables with one-to-many relationships. Four of the tables had an index on the primary key field.

We tested three programs—DataEase, R:BASE, and Salsa—under Windows for Workgroups 3.11. (The 32-bit R:BASE required Win32s.) In addition, we tested all Windows applications, both 16-bit and 32-bit, under Windows 95. DBExpert, the sole OS/2 product in the group, was tested under OS/2 Warp Connect 3.0. We created the data set from comma-delimited ASCII and dBASE III format. All products were installed using the defaults of the package.

For the Windows for Workgroups 3.11 products, we used MS-DOS 6.22 with SmartDrive write-behind caching disabled and a permanent swapfile with 32-bit disk access enabled. Windows 95 didn't require any optimizations. We timed tests from the moment the button or menu item was selected until the product returned the answer or control to the user. We ran all tests three times to ensure consistency and accuracy.

If the program provides some sort of automation process to perform a task, such as a wizard, we started timing the task as soon as the program completed its automation. For the programs that provide such automation, we only used it to form the parameters for the test, not to perform lookups or modifications of the data.
—Analysis written by Dan Smith



The Microsoft Access database engine was slightly faster when we tested it with 12MB RAM, as the product officially requires. N/A—Not applicable: The product cannot perform this task.

ucting in a few hours. Once you've built your application, you can easily put the database on a network and share the data with other users. A separate runtime version of DBExpert ($29) lets you distribute your applications to other users.

DBExpert is an admirable database application that packs a lot of usable functionality into a small area (about 5MB of hard disk space). In an era of ever-larger programs, a package this thrifty (in terms of design) has its appeal. If the relative dearth of usable nonprogramming database design tools for OS/2 has frustrated you, take a close look at DBExpert.—*Richard V. Dragan*

DBExpert 2.0. List price: $149 ($49 upgrade). Requires: 386-based PC or better, 4MB, 5MB hard disk space, OS/2 2.0 or later. Designer Software Inc., Fruita, CO; http://www.dbexpert.com.
(No Indian partner.)

Claris Corp.

FileMaker Pro for Windows 95

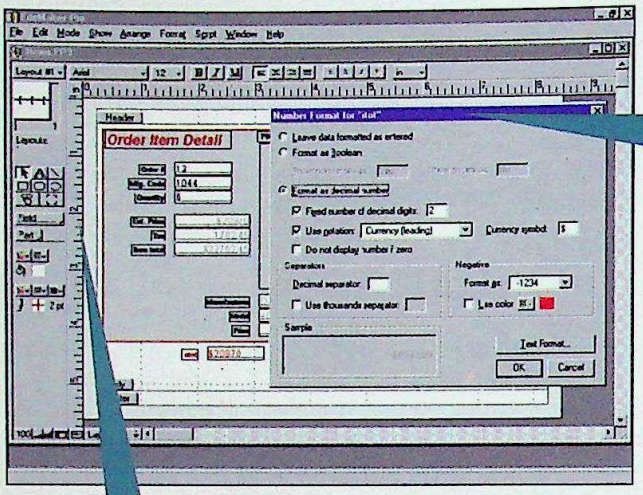
Claris FileMaker Pro 3.0 for Windows 95 ($199) is a capable data integration program that allows users on Macintosh and Windows 95 platforms to share data simultaneously. In this latest release, you'll also find improved field definitions, relational abilities, un-

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limited file size, and OLE 2.0 support.

FileMaker Pro, a 32-bit Windows 95 and Windows NT 3.51 application, provides automatic data format conversion from its prior Windows 3.1 version, 2.1.



FileMaker Pro's tools palette, available during Layout mode, provides access to all available functions.

But the formats are not compatible, so you can't share a database between the two. FileMaker Pro accomplishes Mac/Windows data sharing via built-in IPX/SPX or TCP/IP protocol support.

FileMaker Pro imports and exports data from .DBF, Lotus 1-2-3 files, and basic text formats very slowly. But the program supports advanced table definition field types: A Summary field calculates sub-totals, averages, and grand totals across a group of records. You can use global field types as a variable, accessing them in conditional scripts and by all records. In addition, FileMaker Pro supports OLE through container fields that can hold graphics, sounds, and video.

FileMaker Pro's improved field rules now allow you to define auto-enter values based on the previous record or on a calculation from a user defined calculation in the field definition. You can conveniently perform other validations against user-defined value lists or those from another table, as well as edit your value list without interrupting your data entry. Indexing is automatic by default, but you can handily enable or disable it on each field. FileMaker Pro also comes with more than 40 professional-looking, data-filled templates and sample files.

FileMaker Pro lets you establish multiple relations between tables from one controlling table, but you can't use indirect relations or fields from a third-table or *grandchild* relation in layouts. When you delete the controlling record, the program deletes the related records. If you choose, you can enable or disable the ability to create new records in a related table.

FileMaker Pro uses layouts for viewing, editing, and printing databases. A drop down list box displays all available layouts, which serve as both forms and reports. But FileMaker doesn't support input masks, and only a few display formats exist for numbers and dates. You can force text field contents to accept only upper- or lower-case input. Unfortunately, FileMaker has grouped this option with other font styles and not with the field's format properties.

While Macintosh users may benefit from FileMaker Pro's interface, Windows users will probably find it a drawback. For example, several commands don't appear where a Windows user would expect to find them: To delete a record, you have to look under the Mode menu—not under Edit—and no Record menu exists. At least the contents of this Mode menu change intelligently, depending on whether you select the Browse, Layout, Find, or Preview mode.

To create custom application forms in FileMaker Pro, you build a layout with buttons to activate other predefined layouts. Using this technique, you can switch between modes to automate data entry and printing reports. Although you can create buttons quite simply, you can only change the script from which a button executes if you recreate the button from scratch.

FileMaker Pro's Find mode places you into a Find by Form screen that lets you enter data into any of the fields. You can stack multiple Find requests to create complex queries. In our testing, for example, we selected all customers in the Northeast by entering a separate Find request for each state. Though this method required many steps, it produced the desired result. Once you find the record you want, you can easily step through the records. Note that in any view the found records remain selected until you use the Select menu and choose Find All.

Choosing from the provided list of Avery and CoStar label format libraries, you can readily create labels in FileMaker Pro. But its relational constraints hinder multitable report creation ability: When creating our database application, FileMaker Pro would only let us include fields from the controlling table or fields from directly linked table.

FileMaker Pro lacks built-in charting, SQL capabilities, and the ODBC support that many of the other products reviewed here include. Though ideal for environments with both Windows 95 and Macintosh workstations, Claris's FileMaker Pro 3.0 for Windows 95 ultimately best suits users with simple database needs. For advanced programming, reporting, and remote connection capabilities, look elsewhere. —*TL*

SUITABILITY TO TASK

FileMaker Pro for Windows 95	Power	Ease
General database	Fair	Good
Forms	Fair	Fair
Query and analysis	Good	Fair
Reporting	Fair	Fair
Rapid application development	Fair	Fair
Connectivity	Fair	Good

FileMaker Pro 3.0 for Windows 95. Estimated street price, $199. Requires: 386-based PC or better, 8MB RAM, 4MB hard disk space, Windows 95 or Windows NT 3.51. Claris Corp., Santa Clara, CA; http://claris.com *(Indian partner Wipro, 88 MG Road, Bangalore 560001. Tel: 5588422; fax: 558865*

Lotus Development Corp.

Lotus Approach 96 Edition for Windows 95

PC MAGAZINE EDITORS' CHOICE

Lotus Approach 96 Edition for Windows 95 ($105), from Lotus Development Corp., continues its tradition of combining ease of use with powerful data-access engines. Compatible with previous versions, this new 32-bit version provides a complete relational database management environment that any nonprogrammer can use to develop sophisticated applications

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Approach 96's intuitive interface puts everything at your fingertips. You can access all forms, reports, worksheets, and charts from tabbed pages, so you can easily switch between data views. The Action Bar keeps commonly used menu items, such as adding or finding a record, a mouse click away.

Throughout the process of building forms and reports, the floating InfoBox (also in Freelance, Lotus WordPro, and Notes 4) provides a one-stop access point for modifying attributes of any object or field. You also use the InfoBox to create calculated fields or macros.

In our testing, creating a sales order form in Approach 96 was mostly a drag-and-drop process. Adding intelligent button macros, list boxes, and even the repeating panel required very little effort. The Fast Format icon let us copy attributes from one object to another, which saved us time when we created many similar items such as multiple menu buttons.

QUICK BUILD

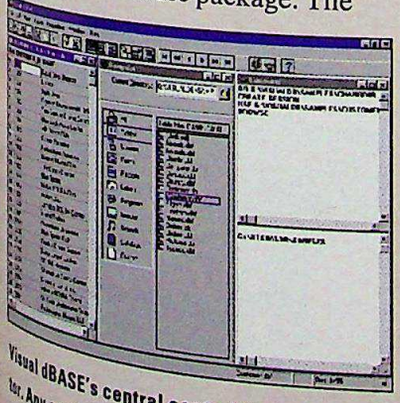
Using the built-in macro commands, we were able to create menus and buttons to automate operations without writing a line of code. More adventurous users can

When Wizards Aren't Enough

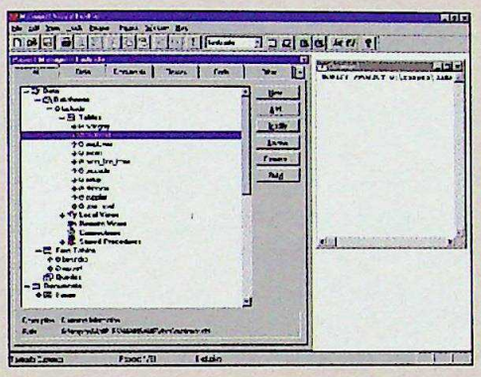
End-user database products tend to let you use only the built-in functions and formulas. In addition, end-user databases can't distribute standalone versions of the applications created in the product without resorting to add-ons.

For the most part, developer-oriented databases provide the solution to these limitations. These databases have sophisticated and complex programming languages that give the developer almost complete control over the manipulation and presentation of data. They provide a wider variety of formulas and functions, and in some cases allow users to create their own functions to perform specific tasks.

Manufacturers of high-end databases also offer a compiler—either included in the program or sold separately—that lets the developer create standalone versions of the application. These standalones are freely distributed to the end users, which reduces the need for (and cost of) multiple copies of the database package. The high-end databases also offer better support for creating Client/Server applications.



Visual dBASE's central control is the Navigator. Any actions you take in the Navigator are automatically translated to Xbase code.



Visual FoxPro's Project Manager gives you access to the entire database application.

We've looked at three of the popular Windows-based developer databases to see how they handle the tasks we put the end-user databases through.

The DOS-based parent of **Visual dBASE,** dBASE, started the PC database revolution back in the early 1980s. Version 5.5 of Visual dBASE ($349.95), from Borland International supports both Windows 3.1 and Windows 95 (though it's still 16-bit). Of course, it supports the Xbase language (the standardized version of the dBASE programming language) and adds a number of object-oriented features that let you easily create complex graphical database applications. Visual dBASE's Experts (similar to wizards) let you effortlessly perform all but the internal mail-merge task. Unfortunately, Visual dBASE is the only one of the three high-end tools that doesn't itself come with a built-in compiler; you have to purchase one of the following: Visual dBASE Compiler ($349.95); Visual dBASE Client/Server package ($695), which contains the compiler as well as all the tools you need to create Client/Server applications; or the Professional Edition ($495.95), which includes both Visual dBASE and Visual dBASE Compiler.

Visual FoxPro 3.0 Professional Edition ($495), from Microsoft Corp., also supports the Xbase language. It's a full 32-bit compiler that also runs under Windows 3.1 with the win32s extensions and supports 32-bit OLE Controls as well as 32-bit ODBC drivers for Client/Server databases. Visual FoxPro comes with a number of Wizards that help perform tasks easily, including the mail-merge task.

Clarion for Windows 1.5 ($449), from TopSpeed Corp., takes a different approach, easier than that found in the other two databases: It starts with a data dictionary and uses the data definition process to build the application. Its native Clarion language is a unique combination of COBOL, ADA, and BASIC-like features. Both 16- and 32-bit developer codes ship in the same package, and it also compiles 16- or 32-bit applications. ODBC support is included; database-specific SQL drivers are available from TopSpeed at additional cost, ranging from $1,295 to $3,995. And Clarion's Application Generator made it easy to perform our tasks. It guided us through the process of creating the basic database and automatically created standard forms and reports that were easily customized to match our tests.—*Joe Salemi*

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One More Feather in the Cap of PC Magazine

Maximum Ad Revenue Among US Magazines

PC Magazine has earned the rare distinction of attracting the maximum number of advertisement pages among US magazines.

According to Publishers' Information Bureau, an independent body of publishers in the US, **PC Magazine** ran 6,314 advertisement pages in its fortnightly issues in 1995. The number does not include the advertisement pages run by **PC Magazine** licencees in other parts of the world including India. **Forbes**, which secured the second rank, was a long way behind with 4,540 ad pages. **Time** was placed third with 2,384 ad pages.

try out LotusScript, Lotus Corp.'s powerful Visual Basic–like language.

To get new users off the ground, Approach 96 comes with more than 50 sample SmartMaster applications and templates as well as a handy set of Assistants to help you through most database tasks. The sample applications range from a typical sales order system to a World Wide Web site tracking system called surfnet. You can use surfnet to launch your own Web browser or Approach 96's built-in OCX-based browser to connect to one of the 500 sample Web sites.

Though it supports ODBC, Approach's unique PowerKeys have the versatility to read almost any native database format, from dBASE to SQL Server, without any conversion or attaching. This allows you to use Approach 96 as a common front end for many disparate data formats.

Approach 96 doesn't use key fields in the conventional sense. Instead, it uses SmartIndexing, which automatically indexes each field or combination of fields as needed. This lets you search on any fields in any database and makes the task of maintaining indexes completely transparent to the user. Throughout our testing, we saw no noticeable degradation in performance caused by this feature.

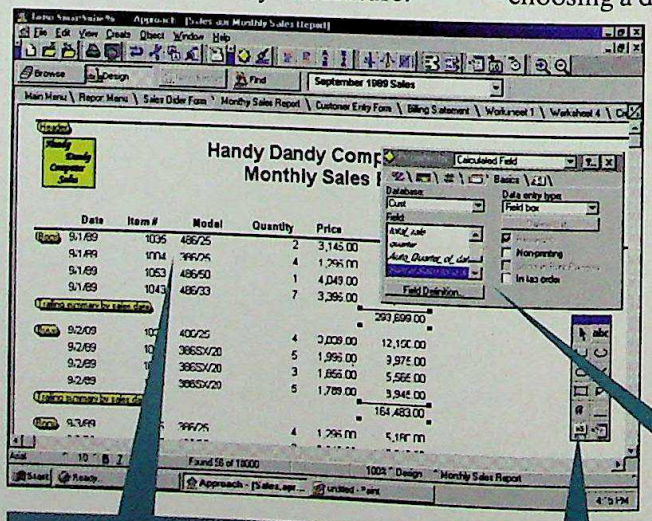
SmartIndexing automatically indexes each field or combination of fields as needed.

QUESTIONS AND ANSWERS

In Approach 96, you can run queries on any field or set of fields simply by entering a query by form mode or by using the powerful Find Assistant. The Assistant walks you through basic or complex queries and sorts, and it lets you save and reuse them as needed. SmartIndexing makes queries even easier: Not only can you query from the worksheet view, but you also have some true worksheet features such as performing columnar sorts and adding formula columns. You can even create dynamic crosstabs by dragging a column to the left margin, similar to Excel's PivotTable feature.

This latest version improves upon Approach's reporting, which was already fairly powerful. The enhanced PowerClick reporting feature lets you see the actual data, groupings, and totals while you're designing a report; this eliminates any guesswork about the appearance of the final output. Again the Assistant will guide you through the process of creating various report types, charts, mailing labels, and envelopes.

In our testing, we used Approach's new Open SQL Assistant to walk us through connecting to a SQL Server, choosing a database, and querying with a SQL SELECT statement. We could see and edit the SELECT before we submitted it to the server. In addition, we seamlessly opened and worked with Lotus Notes data files, something no other database in this review could do. For complete master. For complete Notes connectivity, you



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SUITABILITY TO TASK		
Lotus Approach 96 Edition for Windows 95	Power	Ease
General database	Excellent	Excellent
Forms	Excellent	Excellent
Query and analysis	Excellent	Excellent
Reporting	Excellent	Excellent
Rapid application development	Good	Excellent
Connectivity	Excellent	Excellent

can trigger replication with a Notes Server using Approach's standard macro commands.

A great combination of simplicity and power, Approach 96 should prove ideal for users needing a common front end for different data formats. It's also a perfect match for Lotus Notes shops that seek the ability to access and report on Notes data without developing in Notes or exporting to other formats.—*Greg Alwang*

Lotus Approach 96 Edition for Windows 95. Estimated price: Rs 15,850 Requires: 386-based PC or higher, 8MB RAM, 15MB hard disk space, Windows 95 or Windows NT 3.51. Lotus Development Corp., Cambridge, MA; http://lotus.com. *(Indian subsidiary Lotus, New Delhi; Indian partners ITC, Calcutta, Sonata, Bangalore; TCS, Bombay.)*

Microsoft Corp.

Microsoft Access for Windows 95

PC MAGAZINE EDITORS' CHOICE

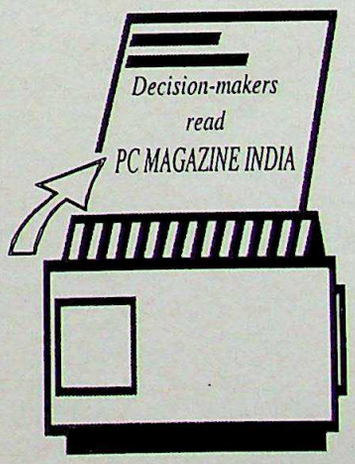
Microsoft Access has always straddled the line between end users and developers, providing enough ease of use and power to appeal to both sides. Microsoft Access for Windows 95 ($339) follows the same pattern, combining a speedy 32-bit database engine and loads of user-friendly additions to ease database creation and integration with other Microsoft Office products and Windows 95 itself.

Access expects its users to know basic database objects such as tables, queries, forms, reports, macros, and code modules. But at the same time, it offers excellent help for creating these objects and almost always provides multiple ways to accomplish a task. Unlike products such as DataEase for Windows that merge the

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SUMMARY OF FEATURES

End-User Databases

■ YES ■ NO

Products listed in alphabetical order	Alpha Five 2	DataEase 5.11 for Windows	DBExpert 2.0	FileMaker Pro 3.0 for Windows 95	Lotus Approach 96 Edition for Windows 95 (PC MAGAZINE EDITORS' CHOICE)	Microsoft Access for Windows 95 (PC MAGAZINE EDITORS' CHOICE)	Paradox 7 for Windows 95/NT
Price	$50 (street)	$495 (list)	$149 (list)	$199 (street)	$105 (street)	$339 (street)	$299 (street)
Native operating environment	Windows 95	Windows 3.1	OS/2 2.0 or later	Windows 95/NT	Windows 95/NT	Windows 95/NT	Windows 95/NT
File Structure							
Native file format	.DBF	Proprietary	.DBF	Proprietary	.DBF	Proprietary	.DBF, proprietary
Supports multiple tables per database file	■	■	■	■	■	■	■
Field Types							
Fixed/variable-length character	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Internal/external memo field	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Currency/Integer	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Automatic incremental integer/Floating point	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Date/Time	■ ■	■ ■	■ ■	■ ■	■ ■	■[2] ■[2]	■ ■
Boolean	■	■	■	■	■	■	■
OLE object	■	■	■	■	■	■	■
Data File Support (import/export)							
Comma-delimited ASCII	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Tab-delimited ASCII	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Fixed-length ASCII	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
User-defined delimiter	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
.DBF (Xbase)	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
.WK* (Lotus 1-2-3)	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
.XLS (Microsoft Excel)	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
SQL Connectivity							
Supports SQL databases natively	■	■	■	■	■	■	■
Accesses ODBC-compliant databases	■	■	■	■	■	■	■
Indexing							
Generates indexes automatically	■	■	■	■	■	■	■
Can remove indexes	■	■	■	■	■	■	■
Can enforce unique values	■	■	■	■	■	■	■
Supports multifield indexes	■	■	■	■	■	■	■
Form-Building Facilities							
Form painter/wizards	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Calculated fields	■	■	■	■	■	■	■
Graphs supported on forms	■	■	■	■	■	■	■
Query and Update Facilities							
Query by form/by example	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Query from command line	■	■	■	■	■	■	■
Accepts SQL syntax	■	■	■	■	■	■	■
Generates SQL syntax	■	■	■	■	■	■	■
Cascades/Updates	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Supports referential integrity	■	■	■	■	■	■	■
Graph Functions (2-D/3-D)							
Bar chart	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Pie chart	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Stacked bar chart	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
High-low-open-close chart	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Output Facilities							
WYSIWYG report painter	■	■	■	■	■	■	■
Supports graphs in reports	■	■	■	■	■	■	■
Banded-column/form-based reports	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Cross-tab/drill-down reports	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Print-preview mode	■	■	■	■	■	■	■
Mail-merge facilities	■	■	■	■	■	■	■
Supports Avery/custom labels	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■

1 Until June 30, 1996; $499 thereafter. 2 Microsoft Access combines time and date in a single field.

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	R:BASE 5.5 for Windows	Salsa for the Desktop 1.0
	$495 (list)	$149 (list)[1]
	Windows 3.1	Windows 3.1
	Proprietary	Proprietary

form creation process with table definition, Access makes a clear distinction: You always start with creating a database and its tables. After that, you can design queries to search for data, build forms and reports on tables or queries, and—if you want to automate your database into an application—work with macros and code modules. All this may overwhelm you at first, but Access lets you work interactively at each stage.

SUITABILITY TO TASK

Microsoft Access for Windows 95

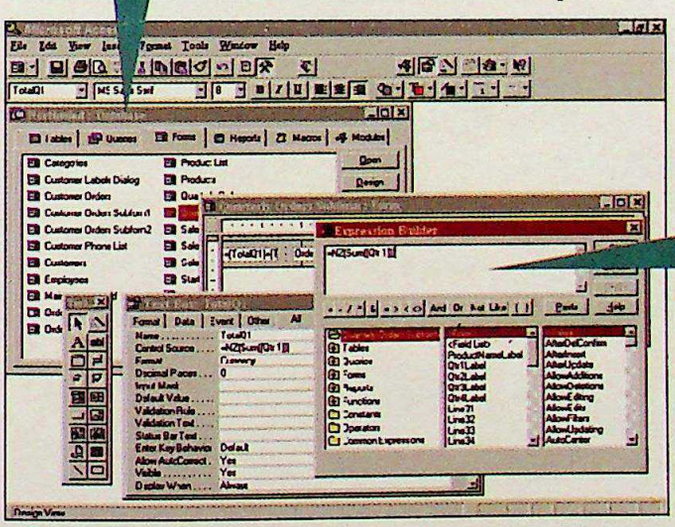
	Power	Ease
General database	Excellent	Good
Forms	Excellent	Good
Query and analysis	Excellent	Excellent
Reporting	Excellent	Good
Rapid application development	Excellent	Good
Connectivity	Excellent	Excellent

SEARCH, LINK, AND BUILD

The Database Explorer comprises the heart of the Access program. Microsoft enhanced the dialog box, formerly known as the Database Window, and designed it to mimic Windows 95's Explorer: It organizes objects in a clear, tabbed window that serves as the launch pad for creating, modifying, and opening your Access objects. Like other Microsoft applications, Access makes extensive use of right-click context menus and user-modifiable toolbars.

Access's standard table, Design View, lets you define fields and their properties, but you can opt to use the new Datasheet View, an Excel-like spreadsheet window that lets you easily build your own tables. You simply type data into the datasheet and Access will automatically define a table for you with the appropriate data types for each field.

Microsoft Access stores all database elements in a single .MDB file and organizes them in the tabbed Database Window.



The Expression Builder makes it easy to build formulas by pointing and clicking, as well as creating references to objects on different forms and reports.

Access provides 22 sample databases and 45 sample tables. It also imports a wide array of data formats and can link seamlessly to several database, spreadsheet, and text formats through ODBC. Access can access local database formats (such as dBASE and Paradox) natively, as well as convert databases created in previous versions of Access or directly work with them in their existing formats.

The Table Analyzer Wizard can scan flat-file data and normalize it into a relational model to import it most efficiently into Access. An Access database consists of a single .MDB file that contains all data, forms, reports, and other objects. Through a new replication feature, you can keep two versions of a database in sync using the Windows 95 Briefcase.

Access did well on all of our performance tests, leading the pack along with R:BASE. We found the product's two reporting facilities, Autoreport helpers and Report Wizards, very helpful. We used the separate Chart Wizard for creating analysis reports and the Label Wizard to design mailing labels. Access now also includes OfficeLinks—connections to Word and Excel—to accomplish specific tasks.

If you need to extend your database into a full-fledged application, Access provides plenty of options that help justify the costlier price (more than half the products reviewed here cost less). The product includes a macro facility with its own design interface to chain menu commands together. For more robust programming, Access—like Excel and Project—uses a form of Visual Basic for Applications as its underlying language. Access Basic is compatible with other ap-

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plications, such as Excel, that use VBA.

This version is also an OLE automation controller/server, so you can drive its features from other development systems as well. Since Microsoft designed Access as a multiuser database, you can share your databases among users who have network installations. With the separate Access Developer's Toolkit product ($499, $399 upgrade), you can create royalty-free runtime versions of your databases for users who don't own Access. And at presstime, Microsoft announced that Access now supports The Internet Control Pack (downloadable from the Web at no cost), which adds Internet functionality to custom applications, and the Internet Assistant (a no-charge add-on), which automatically converts Access tables, queries, forms, and reports to HTML formats.

Access for Windows 95 is a more powerful yet easier-to-use version of an already great product. It continues to evolve in all directions at once and has developed into a product with more depth than any other end-user database. With a variety of user-assistance tools, Access gives those who are not database experts plenty of ways to accomplish tasks and, at the same time, provides a solid foundation for serious database developers.—*SWP*

Microsoft Access for Windows 95. Estimated price: Rs 13,500. Requires: 386DX-based PC or better, 12MB RAM, 14MB hard disk space, Windows 95 or Windows NT 3.51. Microsoft Corp., Redmond, WA; http://www.microsoft.com.
(Indian subsidiary Microsoft India, New Delhi; Indian partners Datapro Infoworld, Pune; Godrej Trading, Bombay; Sonata, Bangalore; TUL, Bombay.)

Borland International Inc.

Paradox for Windows 95 and Windows NT

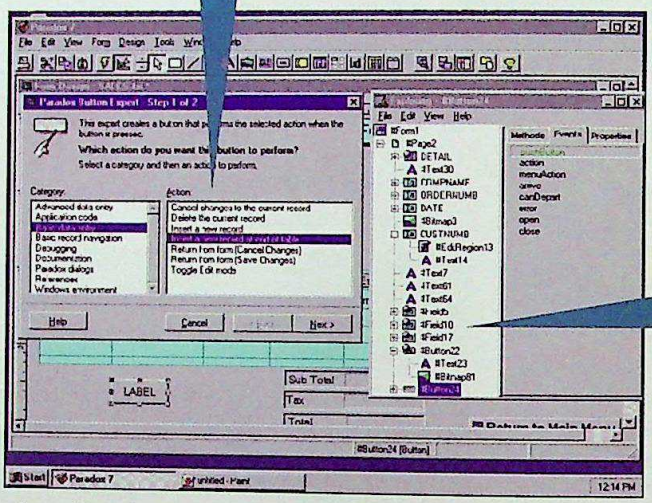
With the $299 Paradox 7 for Windows 95 and Windows NT, Borland International has created a 32-bit workhorse that outshines its predecessors in both strength and usability while retaining unsurpassed compatibility with its prior versions.

Paradox 7 has added many end-user touches in its revamped menu structure and new Experts that assist in the creation of items ranging from tables and reports to action buttons. When we imported data in our testing, the Experts proved worthwhile by building multitable forms, running reports, and creating charts and mailing labels. The Database Expert lets you pick from more than 30 predefined business or personal databases, and it even creates the basic forms and reports for these files.

UNDERSTANDING THE ENVIRONMENT

Keenly taking advantage of the underlying operating system, Paradox augments the Windows 95 property menu with table, form, or report commands—open, design, copy, rename, and delete—when it points to a Paradox file in the Windows Explorer. This lets you invoke Paradox commands from the Explorer without having to first switch manually to Paradox. In addition, the new Project Viewer window lets you quickly switch to any table, form, query, report, or script in your system.

The Button Expert guides you through attaching any of an assortment of actions to a button on a form.



In Design mode, Paradox 7's Object Explorer lets you zero in on the properties of any object on a form or report.

Paradox takes a slightly different approach to database access than do the other products in this review. It uses a query by example (QBE) feature that may seem less intuitive to the uninitiated user, but it's precisely this unique approach that makes Paradox's querying environment so powerful. Ironically, the list of Experts lacks a Query Expert, so end users must learn some query-by-example syntax before they can comprehend the absolute basics. Once you master the QBE syntax, you can do nearly anything. Queries in Paradox not only extract information, but they perform complex operations such as changing fields, joining and linking tables, and performing calculations as well.

You can establish relations between tables with the systemwide Data Model designer or by creating a data model for each form, report, or query. Either method presents you with a concise graphical window, in which you add tables and drag and drop links between the tables. However, the links are for lookup only. In order to enter data from multitable forms into the linked fields, you must define the field in the table structure as a Table Link field.

Paradox shows off its development prowess with built-in object tools that enhance forms with items such as button, list and check boxes, and Windows 95–style tabbed pages. You find most of these tools via the ample toolbar on the design screen. Similar in function to Approach's InfoBox, the new Object Explorer borrows the look and feel of the Windows Explorer and lets you view as well as edit components of any object on a form, including the ObjectPAL code behind those objects.

With Paradox, some knowledge of programming definitely helps. Fortunately, the ObjectPAL help system provides a generous sampling of routines that you can cut and paste to other objects. The presence of ObjectPAL and the graphical development environment gives you ultimate control over the look and feel of the system. We used the built-in constructs to quickly put together custom tabbed page menus and action buttons for choosing different operations in our sample database.

In Paradox, labels and mail-merges are simply point-and-click operations, while charting and basic reporting involve a series of basic choices. You can also create simple multitable reports with the Experts, but more complex reports entail some time spent on design and may require some ObjectPAL code. When you work in Para-

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SUITABILITY TO TASK

Paradox	Power	Ease
General database	Excellent	Good
Forms	Good	Good
Query and analysis	Excellent	Good
Reporting	Good	Good
Rapid application development	Good	Good
Connectivity	Good	Good

Box's design mode, you don't see the actual data on the screen, as you do in Lotus Approach: You can only view an output sample when you run the actual report.

Paradox, always a network-savvy database application, offers broad connectivity with a variety of different data types. This version sports a new SQL Link module for natively connecting to SQL databases and running SQL queries.

Paradox offers a palatable mix of robust development tools and end-user assistance, but the way it handles complex tasks may intimidate first-time users. For Paradox aficionados, though, this new release—with its improved interface, compatibility with previous versions, and 32-bit capabilities—is a must-have.—*GA*

Paradox 7 for Windows 95 and Windows NT. Estimated price: Rs 9,950. Requires: 386DX-based PC or better, 8MB RAM, 13MB hard disk space, Windows 95 or Windows NT 3.51. Borland International Inc., Scotts Valley, CA; http://www.borland.com. *(Indian partners Datapro Infoworld, Pune; Wipro, Bangalore.)*

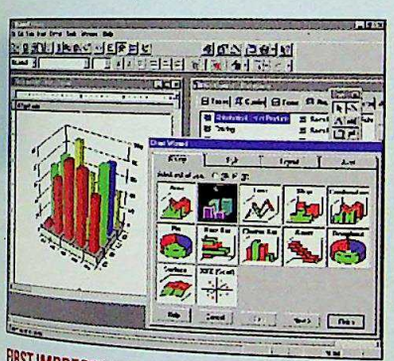
Microrim Inc.

R:BASE for Windows

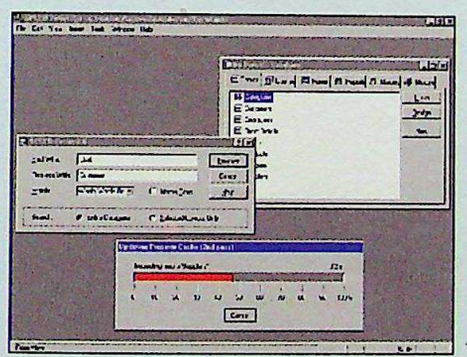
Though not traditionally known for its flash, the latest release of Microrim's R:BASE for Windows offers some appealing user interface enhancements that allow end users to take control of their data without programming. Though this version of R:BASE suits developers best, end users can still find what they need to create databases on their own. R:BASE, now a 32-bit application, runs under Windows 3.*x* using Win32s.

End-User Database Add-Ons

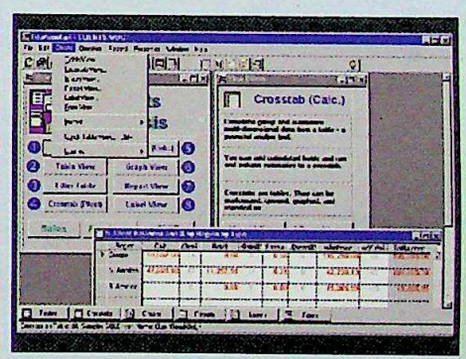
While the enhanced ease of use touted in many of today's end-user databases should make your databasing life a little easier, finding the right add-on tool can take your work to the next level. These database add-ons make program maintenance a snap and help you create that perfect chart or report.—RVD



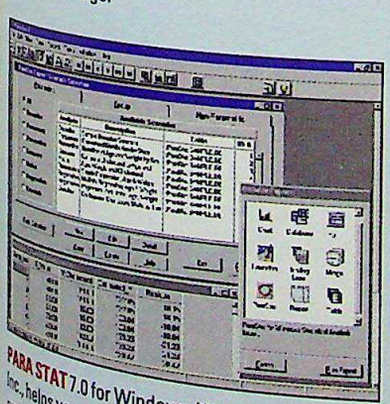
FIRST IMPRESSION 2.0 ($249), from Visual Components Inc., creates impressive 3-D graphs, including photorealistic rendering techniques. This OCX control add-on works seamlessly from within Microsoft Access 95 or any other OCX-enabled package.



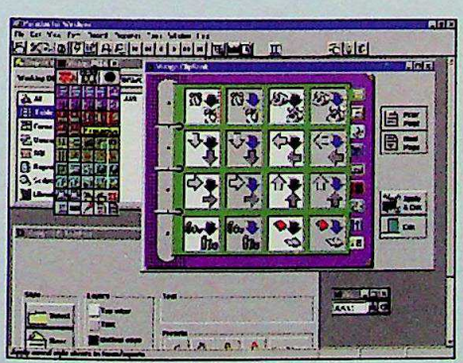
SPEED FERRET for Access 95 ($89), from Black Moshannon Systems, lets you safely change tables, queries, fields, and any other objects in Access databases. It automatically manages backups of objects and tables before you make any changes to your database.



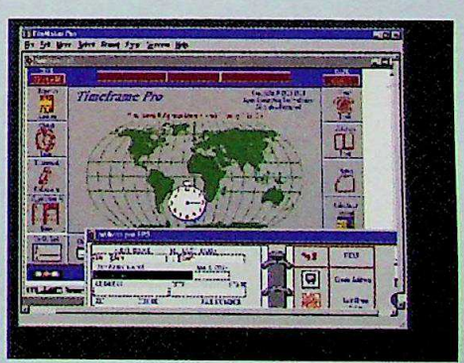
INFOASSISTANT 1.0b ($695), from Asymetrix Corp., offers a truly ecumenical approach to data analysis and decision support. Mix-and-match any ODBC/IDAPI data source, and create intuitive queries and reports (including crosstabs) using Wizard-based assistants.



PARA STAT 7.0 for Windows ($245), from FMS Inc., helps you get high-powered statistical analysis from your Paradox data. Parametric, group (such as analysis of variance), and non-parametric statistical analysis are available using a Paradox 7 Expert. Just specify the data and the type of analysis.



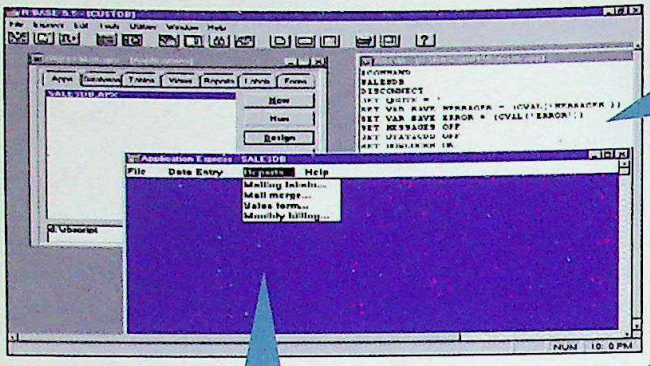
VISAGE 2.0 for Paradox 7 ($299), from Ensemble Corp., simplifies designing Paradox forms. This package lets you easily design forms using a toolbox that controls placement and properties of each control. Also included are custom controls for designing more elaborate Paradox interfaces.



TIMEFRAME PRO FOR WINDOWS ($49), from Apex Computing Technologies, is one example of the thriving market of database solutions tailored to specific real-world settings that FileMaker Pro has inspired. It offers a personal information manager, with contacts, budgeting, planning, and a calendar.

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You can also automatically generate an R:BASE script, which could be several hundred lines of code.

R:BASE for Windows' Application Express lets you design menus visually.

The command center for R:BASE 5.5 for Windows is its Object Manager, which features a tabbed dialog interface that gives you quick access to your tables, forms, and reports. Microrim hasn't adapted R:BASE's interface specifically to Windows 95, though you can use the right mouse button to access menus throughout the product.

BASE OF OPERATIONS

The Database Designer lets you define a table easily with a spreadsheet for defining columns and keys. R:BASE has a proprietary native database format and also supports a wide variety of data types with full coverage of native SQL types. You can rest assured that your data requirements will probably not outgrow the capabilities of R:BASE. Variable-length character fields, for instance, can fill up to 256MB. In addition, R:BASE supports counter data types and binary large object (BLOB) fields, and you can also set rules for fields to ensure data integrity like setting ranges for fields.

Once you define your tables, you can import data from a wide variety of source files, including Microsoft Excel 4.0 and 5.0, dBASE IV, and text files. Based on our performance testing, importing worked smoothly and quickly.

In R:BASE, you design data entry forms with the Form Designer tool. Using the Quick Form option, you can automatically generate a default form with selected fields using a table or existing query for multiple tables joined together on one or more fields. The interface functions smoothly. You can set properties for each field, including formatting for phone numbers or ZIP codes.

SUITABILITY TO TASK

R:BASE for Windows

	Power	Ease
General database	Excellent	Good
Forms	Good	Good
Query and analysis	Excellent	Good
Reporting	Good	Good
Rapid application development	Excellent	Good
Connectivity	Excellent	Good

You embed detail records in R:BASE forms with tiers of records, which designate rows of records that are repeated within a screen area. Once you set a tier, you can edit it by clicking on the right mouse button. Nonprogrammers, though, will have better results on simpler forms, which R:BASE can generate automatically.

With R:BASE, you can query any ODBC-compliant database as well as native tables with its Query By Example tool. You select tables and fields, and R:BASE generates a default query using a Structured Query Language (SQL) statement. The results of queries are saved as views that you can search and sort. Though based on SQL, R:BASE does its best to automate query creation for you. For example, the "Where Builder" helps you filter records, and you can create SQL sort clauses automatically. Despite a few quirks, it's a useful tool for accessing your data.

Once you open a view for browsing groups of records, R:BASE browses, edits, and analyzes data quite well. A number of handy features here help you understand your data. The Compute option lets you view basic statistics for a column of numerical data including minimum and maximum values, averages, and standard deviation. You can create crosstab views easily, add numerical data with the tally option, and group records by the values in a desired column.

Once you open a view for browsing groups of records, R:BASE browses, edits, and analyzes data quite well.

THE REPORTER

When it comes to reporting, R:BASE provides two separate tools: the Label Designer and the Report Designer. Though the Label Designer doesn't support standard Avery label numbers, it includes many common label sizes and can create custom labels. The Report Designer, though competent for basic reports, lacks charting and graphing capabilities. In order to create crosstabs and other sophisticated reports, you have to build R:BASE macro variables, a daunting task for end users.

The Application Express tool, one of R:BASE's most useful features for new programmers, lets you design a menu visually—just click and type items—and then add processing to each menu item such as opening a form or printing a report. Once you're satisfied with your choices, the Application Express tool will generate the R:BASE script code that brings your design to life.

The Application Express tool puts the power of this scripting language into the hands of new users. With it, you can create real database applications complete with multiuser support. (The $695 LAN Pack allows five additional users to share your R:BASE database on the network.)

On the whole, R:BASE 5.5 for Windows proved a solid package, though with fewer ease-of-use features than some of the other products reviewed here. But with a few hours of work, even nonprogrammers can implement this industrial-strength multiuser database.

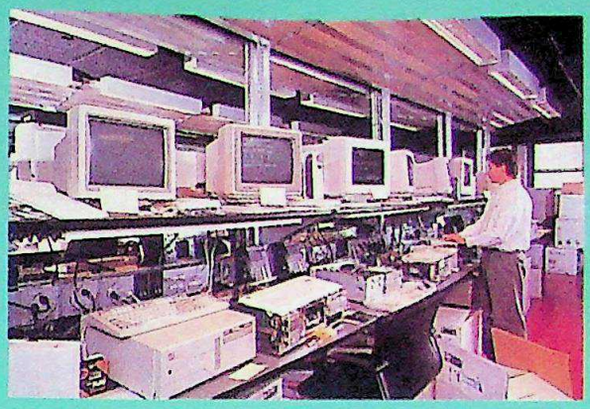
—*RVD*

R:BASE 5.5 for Windows. List price: $4[illegible]. Requires: 386-based PC or better, 8M[illegible] RAM, 15MB hard disk space, Windows 3.*x* or later. Microrim Inc., Bellevue, W[illegible]. http://www.microrim.com.

(No Indian partner.)

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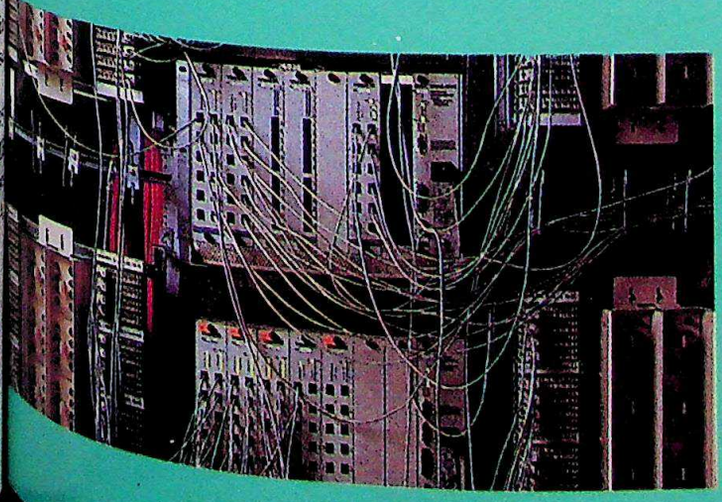


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PC Magazine Labs has 100 permanent systems installed for testing. All test stations are equipped with fiber optic wiring and Ethernet, Token Ring and FDDI connections. Beyond our 53 general purpose testing benches, an additional bank of 32 PCs and two servers are installed to handle dedicated LAN testing.

When it comes to testing cross-platform and wide-area networking solutions, including 3270 products, TCP/IP and super-servers that network hundreds of workstations, we have at our disposal the resources of the Ziff-Davis Labs in Foster City, California. These tests are performed at ZD Labs under the direction of PC Magazine editors.

Advt

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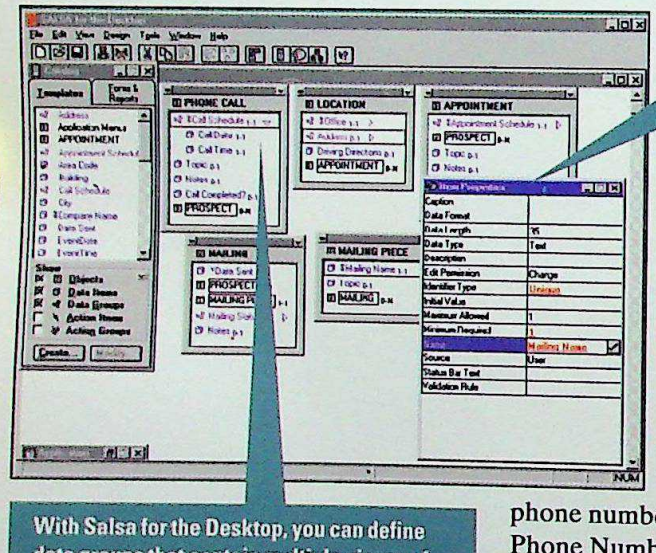
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Wall Data Inc.

Salsa for the Desktop

Wall Data's Salsa for the Desktop 1.0 ambitiously attempts to remove most of the complexity from your database and create an entire custom application for you automatically. While this first release takes an innovative approach and sells for an appealing $149 through this June ($499 thereafter), it lacks the performance necessary for effective application.

Salsa is based on the semantic object model, a database implementation technique that enables users to design data models according to the way they normally think of information, rather than traditional table/field designs. Then, once you've established relationships between the various objects, Salsa will read the data model to create a collection of forms, reports, and query windows for each of the data objects you've defined. It also builds a standard application window and custom menus to provide a fully functional custom application, unlike any other database package reviewed here. Salsa hides complexities such as relationship types and table normalization during this process.



Salsa includes a small set of Starter Kits you can use as starting points for your own application. The Starter Kit you choose determines the data templates you'll have available for your data model; however, you can always create your own as well. Salsa includes three sample application Starter Kits and four sets of templates. Once you've chosen a Starter Kit to work with, you enter the program's workspace window where you work on your data model. Wall Data sells additional Starter Kits separately for $49 each, but we'd like to see more in the base product.

We found some interesting innovations in Salsa's workspace. The program sheds the traditional table-and-field approach and instead offers a more holistic view of your data and the flexibility to design it the way you work. You're free to create "objects" by dragging object templates into the workspace or simply drawing an object with the mouse. If you want, you can define objects as traditional tables. You can also place data items (Salsa's term for fields) and data groups in your objects via drag and drop.

Data groups and multivalued fields provide powerful functionality in an understated and smooth fashion. With multivalued fields, you can break free from the usual one-to-many relationship headaches and define your data the way you think of it. For example, if you want to associate a customer record with a variable number of phone numbers, you can simply define a Phone Number data item in a Customer object and set the Maximum Allowed property to the number of entries you want it to handle. Data groups let you associate multiple data items and treat them as a single entity.

DIPPING IN

Salsa also makes relationships easier to define. To relate data objects, you simply drag the name of an object into the container object of another; you don't have to pick the particular items to relate as you do in other products. Salsa reads your data model when you create your application and converts it under the covers to the appropriate physical data layout.

SUITABILITY TO TASK Salsa for the Desktop	Power	Ease
General database	Good	Good
Forms	Fair	Good
Query and analysis	Fair	Good
Reporting	Fair	Good
Rapid application development	Good	Good
Connectivity	Fair	Good

In addition to data items and data groups, action items and action groups help you fine-tune your application even more. Each Catalog includes a set of action items, common operations you may wish to incorporate into your application. The list includes tasks such as Clear Form, Delete Record, Help Contents, and Print Setup. Salsa automatically creates forms and reports based upon your object model. If the object model contains an action item, Salsa will create a button for that item when it generates the form. You can write your own action items using the product's Salsa Basic language, a dialect very similar to Microsoft's Visual Basic for Applications.

While Salsa built our test application very quickly, we found a few flaws. The program uses a proprietary data format and requires that all existing data be imported. Given this, we were surprised to discover the product's disjointed, lengthy import process, which Wall Data plans to improve in Salsa's next release. We also found Salsa particularly unsuitable for large data sets and sometimes slow in building applications: Our performance tests proved Salsa slowest among the products we tested, and it took almost half an hour on an 8MB 486DX2/66 to rebuild an application. In addition, Salsa cannot display more than 16,000 records at a time in a query result, a hindrance that Wall Data also plans to address for Salsa's next release.

Salsa is a step in a bold new direction and definitely a product to watch. But Wall Data's first iteration comes up a bit short, mainly because of its incredibly slow performance.—*SWP*□

Salsa for the Desktop 1.0. List price: $149 through June 30, 1996; $499 thereafter. Requires: 386-based PC or better, 8MB RAM, 35MB hard disk space, Windows 3.*x* or later. Wall Data Inc., Seattle, WA; http://www.walldata.com.

(No Indian partner.)

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By Brian Proffit

InterNotes: More than Just a Browser

Lotus's solution for connecting business with the Internet.

We continue to be driven by the need for information. Users' hunger for more, better, and faster access to information is matched by IS departments' thirst for easier acquisition, storage, and distribution of that information. Lotus Development Corp. has addressed these needs with InterNotes, one of the most significant enhancements included in Release 4.0 of Lotus Notes.

InterNotes is a transparent coupling between Notes and the Internet. The heart of this coupling is the InterNotes Server, which performs the dual functions of retrieving information from the Internet and converting that information into Notes database format. That database is then available to any Notes client, just like any other database.

HOW DOES IT WORK?

The portion exposed to end users is the InterNotes Web Navigator. As you can see in Figure 1, the Web Navigator looks like any other Notes database on the desktop. The difference is that a shortcut into that database has been added to the SmartIcon bar at the top of the window. Clicking on the hand pointing at a globe lets you immediately enter a URL you would like to load.

When you open the Web Navigator database, you see an interface unlike that of any other browser (Figure 2)—because, of course, you're not really looking at a browser, you're looking at a Notes database. When you ask for a Web page, the request goes to the InterNotes Server. If that page already exists on the server, it is sent directly in Notes document format. If not, the server loads the page from the Internet. The page is converted from HTML format into Notes document format before you ever see it, with all the graphics and hypertext links maintained. And, as Figure 3 illustrates, the Notes document that is generated and the native Web page are indistinguishable.

This conversion does have a side effect, though: Since you won't see any of the document until the entire page has been converted to Notes format, you don't see the graphics as they are painted and you can't begin scanning the text before the graphics download is complete. The more graphically complex the page, the more annoying that delay can be.

The graphical support is good, and it includes support for pages with fill-out elements like text boxes. InterNotes supports only HTML 2.0, though, and doesn't include such enhancements as frames, tiled background images, blinking text, background sounds, and marquee scrolling. Both interlaced and noninterlaced .GIF types are supported as well as plain JPEG, but not Progressive JPEG. Multimedia extensions aren't supported, either. Unsupported graphics are replaced by the familiar icon you see when waiting for a graphic to load, while unsupported text features simply appear as plain text in the Notes version of the page. Table support is included, though it's rather rudimentary, using line-drawing characters instead of graphics.

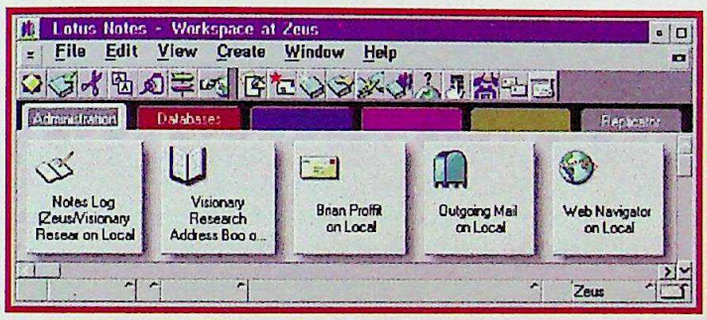


FIGURE 1: *The InterNotes Web Navigato: iooks like any normal database in the workspace.*

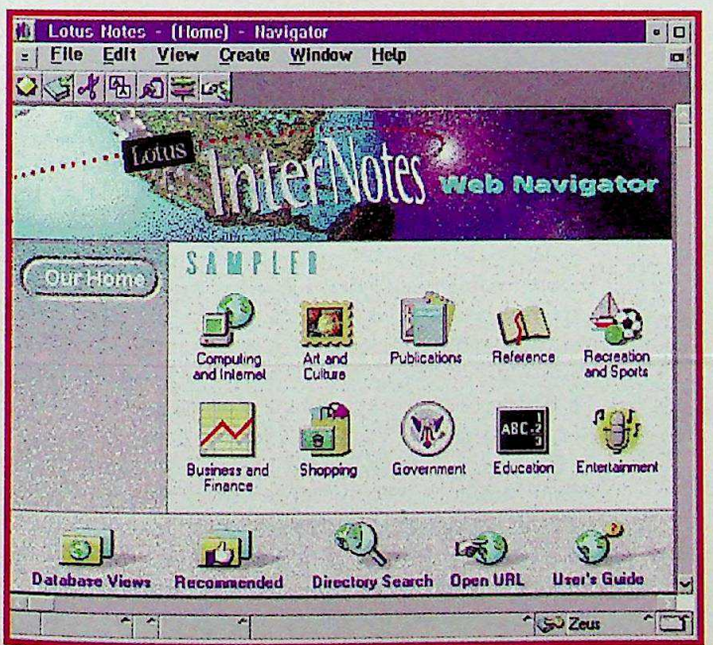


FIGURE 2: *Web Navigator provides an interface to Internet resources.*

Lotus promises continued support of evolving Web page enhancements—including Netscape extensions and the developing VRML standard. But some of this support may prove difficult, as it requires upgrading the capabilities of Notes documents. Since helper apps don't work, at least not with this release, that means updating the basic Notes document architecture. It isn't likely to happen soon.

Web Navigator doesn't limit you to Web pages. In addition to HTTP, it supports downloading from FTP and Gopher sites and embedding HTTP, FTP, Gopher, and mailto links within Notes documents for easy, single-click access. Web Navigator also supports authenticated sites, providing an automatic dialog box that prompts for ID and password before allowing access to those sites.

TIME AND SPACE

In large companies, dozens of users may need access to the same information. If that information comes from the Internet, each user normally needs to attach to the Internet and download the pages—a massive duplication of time and effort that can strain external communications links and hinder productivity. Storing the information on multiple desktops is a further duplication that wastes resources. But the alternative—reloading the same pages again and again—is hardly satisfactory.

InterNotes neatly resolves the dilemma by providing a single server to contain the necessary pages. When a user requests a page, it can frequently be loaded from the server (at network speeds), thus avoiding an Internet con-

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From News to Notes

Access to Usenet newsgroups is not an integral part of the Notes 4.0 Web Navigator, but Lotus provides a solution in the form of a separate product. InterNotes News, originally developed and released by IRIS Associates, acts as an interface between Notes and Usenet.

Using the Network News Transfer Protocol (NNTP), InterNotes News runs on the InterNotes server and converts Usenet data into Notes documents. Users can browse newsgroups and send replies from their local systems without directly accessing the Internet. Through SMTP mail connections, users can also send replies to the authors of news items via e-mail.

Users have the advantage of being able to view news items using the familiar Notes discussion database, with its hierarchical view of threads, full text search, and macro capabilities. And administrators can make Usenet information available across the enterprise without the need for TCP/IP on each desktop, while maintaining centralized control over newsgroup subscriptions and access.

nection and download. The InterNotes Server administrator can keep the Web database current using a new feature of Notes 4.0—*agents*, which are similar in concept to macros and provide significant power.

One type of agent included with the Web Navigator database is a refresh agent designed to access the Internet periodically and reload new copies of frequently changing pages. By default, the agent runs daily at midnight, checking the date last modified on each document against the current date. If the dates don't match, the agent retrieves the last modification date in the HTTP header from the Internet server. If the page has been updated since last retrieved, the agent downloads the latest version of the page, converts it to Notes document format, and updates the document in the database.

Agents can also assist in controlling the size

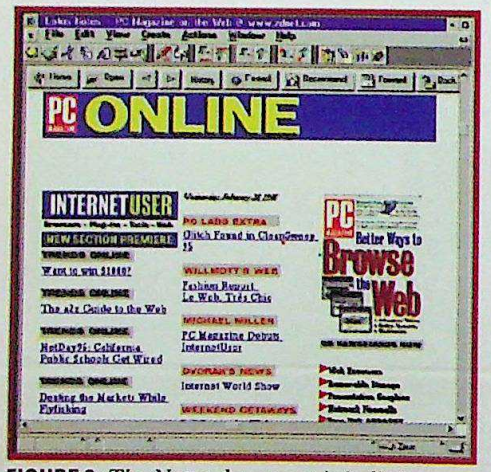


FIGURE 3: *The Notes document is indistinguishable from the original Web page.*

of the Web Navigator database. Not only can you set a firm upper limit on database size, but a purge agent included with Web Navigator can traverse the database each night, selectively removing pages based on criteria you define. For example, you can instruct the purge agent to remove automatically any documents whose pages no longer exist on the Internet or to remove documents after a specified number of days. And you can optimize space by automatically purging documents larger than a specified size (the default is 256K). Users can thus download large pages as needed, without regard for long-term storage considerations. You can even specify whether the purge agent should check private folders that users may have created and purge documents from them as well.

NEW POSSIBILITIES

Time and resource savings aren't the only reasons to use InterNotes' Web Navigator. One of Notes' nice features is its ability to do full-text searches through Notes databases. Since InterNotes stores Web pages as Notes documents, you can do full-text searches through Internet data as well. You also gain the ability to browse quickly through available Web pages using Notes 4.0's window panes, shown in Figure 4. In fact, once you stop thinking of Web Navigator as a Web browser and start thinking of it as a Notes database, many new possibilities unfold. You can forward Web pages to other Notes users, and you can cut and paste from Web pages into other documents or into e-mail.

For more sophisticated manipulation, there are new @functions and LotusScript methods available for processing Web data. Developers can use @URLGetHeader to retrieve the HTTP header information, @URLHistory for maintaining and traversing history lists, and @URLOpen for retrieving specific pages. There are also three new LotusScript methods designed for the Internet. OpenURLDb returns a pointer to the Web Navigator database, GetDocumentByURL retrieves a page as a Notes document, and GetURLHeaderInfo retrieves the HTTP header for a page.

Internet hot links can be embedded into other Notes documents. Thus you can send an e-mail suggesting that the recipient take a look at a Web site, and the address you include in the message can be a hot link directly to that location. In fact, you can create customized Web tours that will guide others through a series of pages you find interesting. This is a great way, say, to bring employees up to speed on the competition. You can even create recommendation databases by grouping Web sites within the categories shown in Figure 2 and giving them a rating from poor to excellent (1-5). Then, a user looking for an Internet resource on computing, for example, can see exactly which Web sites have received the highest ratings in that area.

And you're not limited to the folders provided with Web Navigator. You can create your own folders for storing Web documents in ways that are meaningful to you, and a private bookmark folder gives you quick access to documents you refer to most frequently.

GETTING THE INFORMATION OUT

Today organizations are not only interested in acquiring and disseminating to employees the information located on a variety of Web sites. They are equally attracted to the idea of creating their own Web sites, complete with company and contact information, product lines, development efforts, and so forth. But creating and managing an enterprise Web server is no small feat, often requiring the input of many departments and individuals, few of whom are likely to be Web experts. Enter InterNotes Web Publisher, a Notes server program that builds on Notes' existing document management system to provide an automated method for creating and managing a Web site.

InterNotes Web Publisher lets you take Notes documents from disparate users and convert them automatically into HTML for



FIGURE 4: *You can quickly browse stored pages for the desired information.*

mat. Thus, for example, Notes documents become HTML files, Notes forms become HTML forms, and Notes doclinks become hypertext links. Those skilled at creating Notes documents can make good use of this facility.

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should be noted, however, that for now the functions you can put in your pages are restricted to the HTML 2.0 specification, as indicated above. Web Publisher will also create a home page for your database using the About Database document; the database views appear as hypertext links on the home page.

It doesn't take much of a leap to grasp the possibilities inherent in the Internet and the flexible HTML format for distributing information within an organization as well, and many companies are heading in this direction. And it's an equally modest jump to the realization that the same Web Publisher facilities that let you publish company information online make it easy to construct an intranet for sharing internal information.

SECURITY

Since the InterNotes Server is the only machine on the system that directly accesses the Internet, it is the only one required to run TCP/IP. Not incidentally, this centralized server gives the administrator security control over access to Web pages. The administrator can allow or deny access to any Internet site by name or IP address. Wildcards are supported, making it easy to restrict users to specific sites: You can deny access to *www.*.com* while permitting, for example, visits to *www.pcmag.com*. The tighter security that's derived from a single point of contact with the Internet extends to the enterprise as well. You can place the InterNotes server behind a firewall proxy server to prevent intrusion.

ADDING IT UP

In companies looking for tight control over Internet access and document storage, InterNotes may indeed become the product of choice. With Web Navigator, retrieving static pages and sharing Internet information with others is as easy as handling any other information in Notes, and Web Publisher does the same for putting out the information. Both suffer from the HTML limitations noted above, however. And if you're in a real hurry for a page you're not likely to need again, you may well prefer a browser that doesn't force you to wait through the intermediate step of converting from HTML to Notes document format. Also, Web sites are already beginning to make heavy use of advanced HTML functions and enhancements not yet available in Web Navigator.

Lotus avows a commitment to enhance InterNotes so that it meets and keeps pace with the capabilities of other browsers and Web publishing tools. The key will be whether it can respond sufficiently with upgrades as enhancements like animation, multimedia, and Java applets become more widespread. □

Brain Proffitt is a senior contributing editor of OS/2 Magazine and author of OS/2 Warp Survival Kit.

ZD PC Benchmark Enhances Lead over PC WorldBench

The latest addition to Ziff-Davis PC benchmark product testing team is Winstone 32. Winstone 32 is ZD's benchmark for measuring the overall performance of PCs running Windows-based 32-bit business applications. Winstone 32 will run on both the Windows 95 and Windows NT 3.51 (and higher) operating systems.

ZD's other PC benchmarks include:

Winstone 96, an application-based benchmark for measuring the overall performance of PCs running Windows-based 16-bit business applications.

WinBench 96, a subsystem-level benchmark that measures the performance of a PC graphics, disk, processor/RAM, full-motion video, and CD-ROM subsystems in a Windows environment.

These two benchmarks will run on either Windows 3.x or Windows 95.

As we all know, *PC World's* PC WorldBench was an attempt by that publication to create a contender to ZD's industry-standard Winstone 96 benchmark. PC WorldBench, however, falls far short of being a serious competitor to Winstone 96 alone, much less to the team of the three ZD PC benchmarks. Many critical differences between not only the benchmarks of the two companies, but also the development and testing methodologies the companies use, make clear the superiority of ZD's approach.

Lets start with something simple: How each company creates benchmarks. ZD does not gather developers and contractors for a short, one-time project to produce a benchmark program. Instead, ZD maintains a dedicated benchmark development organization, the Ziff-Davis Benchmark Operation (ZDBOp), that produces all of ZD's publicly available benchmark programs. ZDBOp's staff of nearly 40 people works year round, updating ZD's benchmark programs to keep pace with the latest technologies. In fact, the ZDBOp development teams are already hard at work preparing the next versions of Winstone and WinBench.

The differences between the approaches of the two companies are even more apparent when you look closely at their benchmarks. Where *PC World* offers one benchmark that uses just three 16-bit applications and three 32-bit applications, ZD offers a team of three different benchmark programs, each designed to measure specific aspects of a PC's performance. ZDs Winstone 32 includes eight leading 32-bit leading 32-bit apps, and Winstone 96 includes 13 leading 16-bit applications. In addition, PC WorldBench makes life hard for testers by requiring them to already own and have installed the six applications it uses. (This requirement also makes it difficult for any two testers to get the same results, because to do so they must have installed all the applications identically on every system they test.) Both Winstone 32 and Winstone 96, by contrast, contain everything you need to run the programs. All you need is the one ZD PC Benchmarks CD-ROM, and the full power of Winstone 32, Winstone 96, and WinBench 96 is in your hands!

The bottom line is simple: For the right approach in benchmark programs in particular and product testing in general, ZD sets the standards.

ZD has been testing products longer and better than anyone else in the business.

We were the first to conduct scientifically controlled labs-based testing of computer products at *PC Magazine* in 1984.

We were the first to create a centralized testing lab. ZD Labs is a facility that today remains the largest independent computer product testing lab in the world.

ZD devotes more resources to product testing and benchmark development than any other publisher. No other publisher makes this kind of commitment to product testing!

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By Barry Simon

The Windows 95 Exchange Inbox

Learn how to tap the power of Windows 95's e-mail client.

Included with Windows 95 is a powerful, universal e-mail client called Exchange Inbox. Remarkably, the printed documentation for this program is only one sentence long. What's more, the online help fails to cover a number of the program's features. This results in user complaints about things like Exchange's inability to save the address in a message to an address book. Actually, this feature does exist, but not only is it unintuitive, it is completely undocumented.

My goal in this article is to cite some of the main features of Exchange Inbox I've found through considerable experimentation with the program and some consultation with Microsoft. Several of its features, especially the search capabilities, are extremely useful. Although the user interface isn't awful (it's miles beyond Lotus Notes Mail), it is often disorienting. This is especially true if you're used to the Windows 95 Shell, because Inbox looks and acts much like Explorer—though with many subtle differences.

MAPI

Underlying Exchange Inbox is MAPI, Microsoft's Mail Application Programming Interface (Figure 1). MAPI serves as the glue between five kinds of objects: Message Stores, Address Books, Service Providers, MAPI-aware applications, and the MAPI client.

Message Stores are files of OLE objects, the most obvious example of which is an e-mail message. But you can also use message stores to store any file with an OLE header. Information about the file from the OLE header will be displayed in the object list on the right side of an Exchange Inbox window.

The *Address Book* specification is quite extensive, allowing the addition of service provider–specific fields to the address entries.

Service Providers supply the back end for MAPI—the links a MAPI client calls to send and collect mail. Don't confuse this use of the term with Internet service providers (ISPs), companies that offer Internet access.

MAPI-aware applications call the MAPI client mostly via a Send item on the File menu. If you install Microsoft Fax, for example, you get a printer named Microsoft Fax, which, despite its name, is just a call to the MAPI client. (It can be used to send e-mail as well as faxes.) So through Microsoft Fax any program can gain some degree of MAPI awareness.

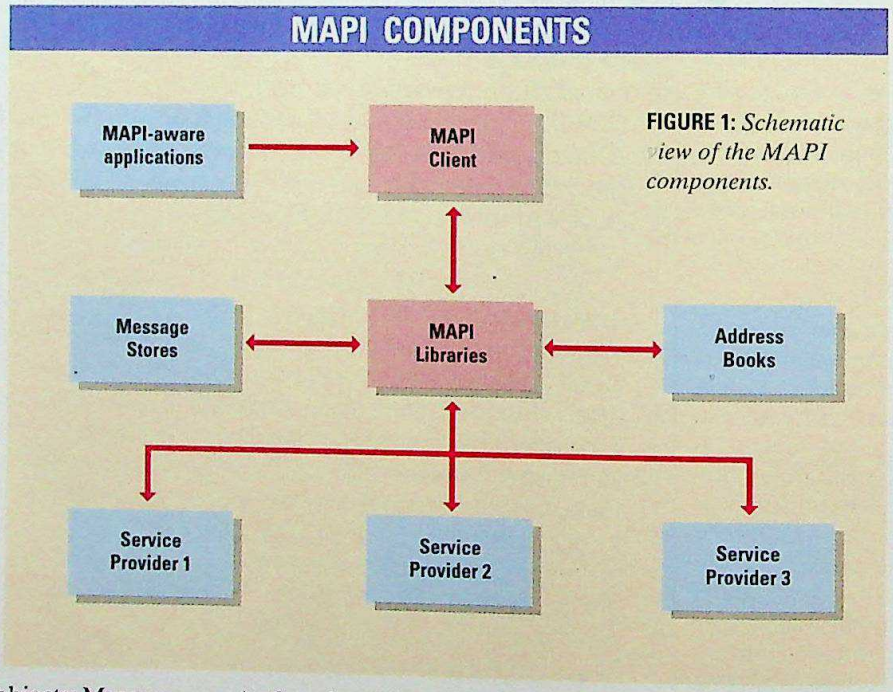


FIGURE 1: *Schematic view of the MAPI components.*

As the roles of the other MAPI players suggest, the central object is the *MAPI client* (the Exchange Inbox itself). The MAPI client is responsible for letting the user interact with the Message Stores, the Address Books, and the Service Providers.

MAPI UNDER WINDOWS 95

Windows 95 includes three sets of programs to implement MAPI: a variety of Service Providers, the Mail and Fax applets in the Control Panel for putting the components together, and the Exchange Inbox, which acts as a front end to access your address book and your message stores.

Three providers are built into the Windows setup and can be installed either during initial setup or later, through the Add/Remove programs applet: Fax, The Microsoft Network (MSN), and Microsoft Mail. On the Windows CD, in the directory \drivers\other\exchange\compusrv, is a CompuServe provider (you can download an update from CompuServe in the Windows Connectivity forum, GO WINCON). An Internet Mail module for Internet providers using SMTP/POP mail servers comes with Microsoft Plus! The module is also in the Internet Explorer file that you can download from Microsoft's Web site.

Microsoft Exchange Server, an enterprise-wide information manager/mail system currently in beta, will include an enhanced MAPI client. To avoid confusion, Microsoft suggests calling the enhanced module the Exchange Client and calling the MAPI client that ships with Windows the Exchange Inbox.

MAPI is an open spec, so we can expect alternate MAPI clients to emerge soon. Delrina's WinFax PRO ships with a full-fledged MAPI client that can read and use the same message stores and address books that Exchange Inbox does. And although it will not include a full-fledged client, QualComm's Eudora Pro will have a module that intercepts MAPI calls by MAPI-aware applications and routes them to the Eudora e-mail program.

EDITORS

Exchange Inbox comes with a decent text editor for composing and reading messages. It produces rich-text-format documents (for now, only MSN and some Internet systems support RTF) with OLE-embedded documents. It will perform spell-checking if you have Microsoft Office 95 installed.

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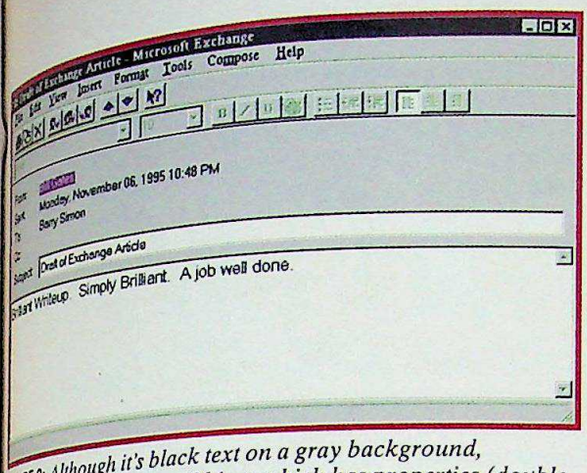


FIGURE 2: Although it's black text on a gray background, you can select this Address Object, which has properties (double-click to see them) and a Context menu (right-click).

Then again, if you do have Microsoft Office 95, you can install Microsoft Word itself as your e-mail editor. This mode of Word, called WordMail, is an installation option during Office Setup. Once it's installed, you can switch between editors using the WordMail Options... choice on the Compose menu in Exchange Inbox.

WordMail gives you a number of Word's wonderful features, such as keyboard macros, highlighting, on-the-fly spell-checking, AutoCorrect, and AutoText. But there are also some features of the Exchange Editor that have not been carried over: There is no longer an Insert Message menu item; you'll need to use copy and paste instead. Nor is there a button to add an address to your address book from a displayed *Address Object* (discussed below); you'll have to use the Context menu of the address object.

All things considered, however, if you have Microsoft Office 95, you'll probably want to use WordMail.

ADDRESSING SHORTCUTS

While composing a message, you can call up an address book by pressing the To: or cc: buttons, but another method is often quicker: If you type in a partial name and hit the Check Names button, the editor will check the address book. If there is a unique match, it is entered. If there are multiple matches, a list is presented from which you can choose.

You can even enter multiple partial names or partial addresses, separated by semicolons, in the To: and cc: fields, hit the check button, and resolve each name in succession.

If you hit the Send button with unresolved names, the editor will try resolve them at that point.

ADDRESS OBJECTS

Look at the header portion of an incoming message in the Inbox Editor (the part that contains the To: and From: information). Because it is black text on a gray background, you may think of it as static and dead, but it isn't. Select a name from those fields and double-click on it (Figure 2). If a name isn't recognized as being from your address book, you'll get a panel notifying you, as shown in Figure 3.

Some address objects are tokens of address book entries: When you double-click, you get the full, tabbed address-book dialog for the name. Other address objects have only three fields: display name, e-mail address, and e-mail type.

Notice that Figure 3 also shows a button labeled "Add to Personal Address Book." That's one way to add someone to your personal address book when you get a message from them—simply double-click on the name, then click this button.

If you are using WordMail in place of the Inbox editor, the Add to Personal Address Book button will be absent, but there is another way to add to the address book. With either editor, there is a context menu that includes an entry called "Add to Personal Address Book" (Figure 4). You get this menu by right-clicking on the address object.

Address objects also occur in messages that you compose—underlined names in the To: and cc: boxes. For example, if you reply to a message from someone not in your address book, his or her name will appear underlined in the Reply. Double-click on such a name and you'll get the same three-field panel that you get for an address object on an incoming message.

Address objects have properties typical of other objects in Windows 95. Not only is there a context menu, you can also drag and drop address objects or copy them to the clipboard and later paste them.

As a simple example of how the ability to drag and drop address objects is useful, consider what happens when you hit the Reply to All button in an incoming message. The names of the sender and all people in the To: section of the initial message are placed in the reply's To: field, and the cc: names from the initial message go in the reply's cc: field. What do you do if you want the To: field to have only the name of the initial sender and you want all the other names in the cc: field? Simple! Just click on the address objects in the To: field that you'd like in the cc: field and drag them there.

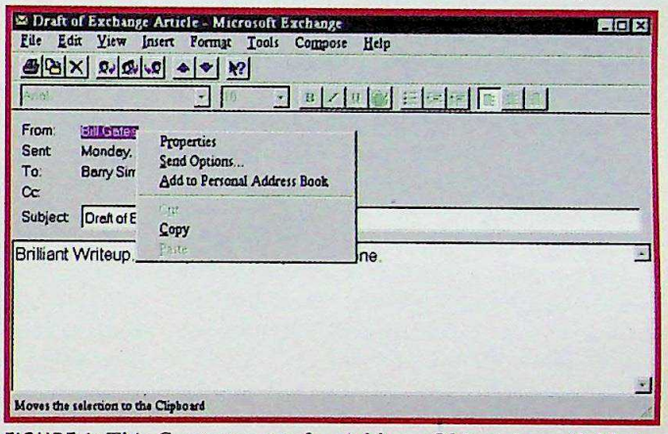


FIGURE 4: This Context menu for Address Objects is available by right-clicking. Note the command Add to Personal Address Book.

It's also possible to drag and drop an address object from an incoming message to an outgoing one. If you hold down the Ctrl key while you use the mouse, you can click on several address objects and drag them all at once. (If you do that, the address objects may appear without semicolons between them. But that's no problem—sending the message or clicking the check button will automatically insert the missing semicolons.)

YOUR OWN ADDRESS OBJECTS

If you want to send a message to someone without adding his or her name to your address book, you can drag and drop or copy and paste—as long as the name appears in some incoming message. But suppose you have an address of someone written on a piece of paper or written out inside a message to you, and you want to e-mail that person without placing his or her name in your address book.

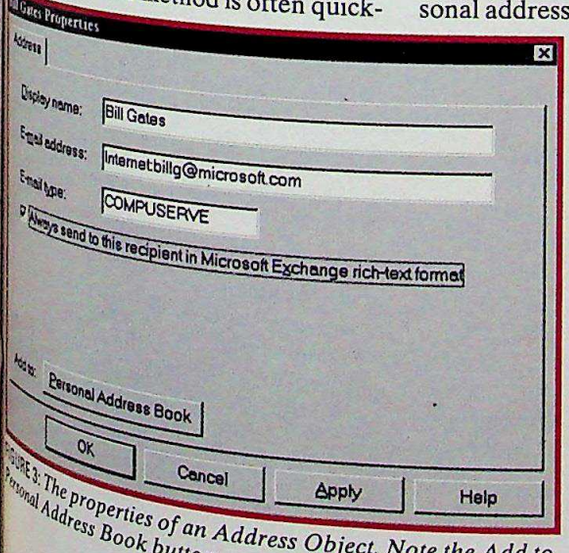


FIGURE 3: The properties of an Address Object. Note the Add to Personal Address Book button.

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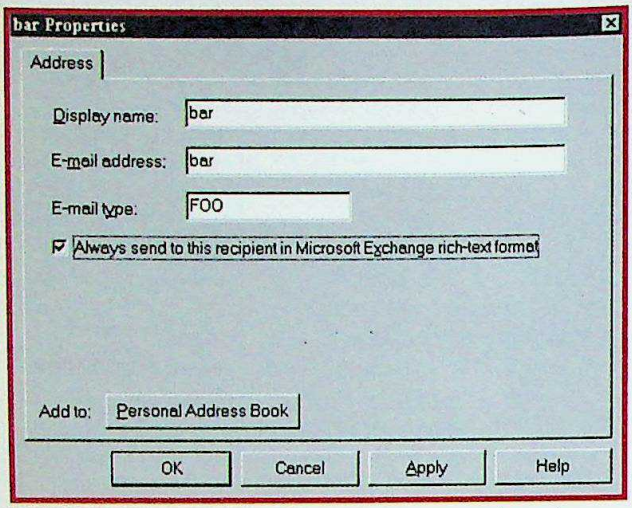


FIGURE 5: *The properties of the object you create by typing [foo:bar] in the To: box and hitting the check button.*

You can create your own address objects using one of two syntaxes. The first, using "[ ]" and ":", is generic, and the second, using "@" and a ".", is specific to Internet addresses. To understand the first, hit the compose button, type [foo:bar] into the To: box, and hit the check button. Magically, [foo:bar] is replaced by bar with an underline.

If you double-click on the new address object, you'll find the fields have been set with the e-mail type set to "FOO" and the name and address fields set to "bar" (Figure 5). From this dialog, you can edit any of the three fields.

Of course, you wouldn't want to make an address object with a nonsense type like FOO, but you can use this method with the proper mail types:

CompuServe	COMPUSERVE
Fax	FAX
Internet	SMTP
The Microsoft Network	MSN

For example, to send a one-time fax to the number 800-123-4567, you'd type in [fax:1-800-123-4567] and hit the check button. If you wanted to change the display name, you could double-click to edit it.

If you use a nonsensical e-mail type or misspell a valid one, the editor will let you "send" the message but at some point you will get a message from the System Administrator telling you that there is no valid service provider given. If the invalid address is the only one, this happens immediately. If there are both valid and invalid addresses, the complaint only comes after the message has been sent off to the valid addresses. In either event, the original message is placed in your Sent Mail folder—a strange convention if there are only invalid addresses.

INTERNET ADDRESSES

Besides the [TYPE:address] syntax for creating address objects, there's a second special syntax that understands Internet addresses. To be recognized by Inbox, an Internet address must include the @ symbol and must include a period in the portion following the @ symbol (for example, billg@microsoft.com). When you hit the check button, it becomes an address object with type SMTP, the appropriate type for Internet mail.

SMTP is a valid type for both direct Internet Mail and MSN but not CompuServe. To get CompuServe to recognize such an address object, you need to change the type to COMPUSERVE and add "internet:" in front of the address.

As with address-book checking, you do not need to hit the check button after entering a totally valid address in either of these formats—when you hit the send button (or pick Send from the File menu), the address objects are created.

MULTIPLE INTERNET MAIL PROVIDERS

There is a potential problem with Internet mail. If you've installed MSN, you will have difficulty if you subsequently install the Internet Mail Provider. The symptom of the problem is that when you connect to your Internet provider, you'll be able to receive Internet mail, but any Internet mail you have set to send will remain in your out-box.

You can see the cause of this problem—as well as its solution—by calling up the Options dialog from the Tools menu in Exchange and looking at the Delivery tab. The lower part of that Tab has a list labeled, "Recipient addresses are processed by these information services in the following order" (Figure 6). What that means is that when an e-mail type is understood by multiple services, it is processed by the one that is highest on the list. Both MSN and your Internet provider understand SMTP, the Internet e-mail type, so to send Internet mail via your Internet service provider, you need to be sure that Internet Mail appears higher on this list than MSN. Just highlight it and use the arrows to the right of the list to move it up.

ORDER OF SERVICE PROVIDERS

Under the Tools Menu are two submenus that let you choose which service to send and collect mail from: Deliver Now Using and Remote Mail. You may wonder how Exchange decides the order in which the services appear there. Remarkably enough, it uses the list in the Tools/Options/Delivery tab I just discussed. The order of services on the submenu is the exact opposite of the list of services in the Delivery tab. By adjusting the order of that list with the aforementioned arrows, you can control the ordering of the services in the Deliver Now Using submenu.

PROFILES AND MULTIPLE MESSAGE STORES

The Mail and Fax applet of Control Panel lets you add and remove service providers and message stores kept in a profile. You can use the Show Profiles button in that applet to set up multiple profiles for Exchange.

Multiple profiles are useful if a machine has multiple users. Profiles can use the same message store, so, for one service, portable computer users can create multiple profiles that differ only in their access phone numbers. Profiles also make it easy to use multiple accounts on a single service. You can only have one instance of the service provider, but each profile can include a different account number for that service provider. On a system with multiple active profiles, you can configure Exchange to prompt for the profile to be used each time it starts.

Although you can have only one instance of each service provider, a profile can have multiple message stores and use Exchange

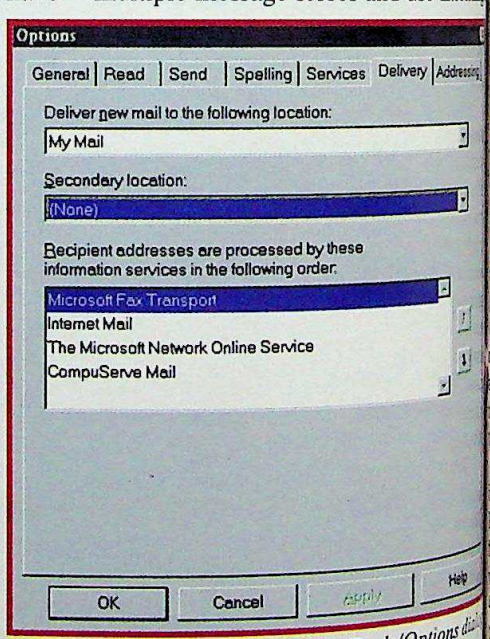


FIGURE 6: *The Delivery tab of the Tools/Options dialog in Exchange Inbox.*

Inbox to copy or move messages between different stores. This is useful for moving messages to an archival store and for transferring messages collected on a portable to your desktop message store.

All in all, Exchange Inbox is a powerful, intriguing program—once you take the time to learn its ins and outs. □

Barry Simon is a contributing editor of PC Magazine.

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By John Lam

A New Way to Open Windows 95 Files

This shell extension creates multiple file associations.

One of the most useful features of Windows 95 is also one of its most painfully limited features. If you double-click on a filename in Explorer, Windows will open that file using the file's associated application—if an association already exists. Otherwise, Windows will show you its Open With... dialog box and ask you to associate an application with the extension of the file you just double-clicked on.

I use this feature all the time to open .TXT files in Notepad (the default association). But what if I wanted to open the same .TXT files in Microsoft Word? This is the painful part. I would have to open Microsoft Word, select File Open, and use the dialog box to find the file that I was already looking at in Explorer! And I thought Windows 95 was supposed to make my life easier! But now it can.

This issue's utility, MultiLaunch, lets you associate more than one application with a file extension. It is a Windows 95 shell extension that you access through a file's context menu—the menu that pops up when you right-click on its icon. MultiLaunch adds a section to the context menu that lists programs you can use to load the document. Figure 1 shows three new items in the context menu of BOOTLOG.TXT: Notepad, Write, and WinWord. Click on any of these three menu items and you will open the file using that application.

You can obtain MultiLaunch by downloading it from PC Magazine Online or by mail. Refer to the sidebar "Guide to Our Utilities" for details. The source code for MultiLaunch, which was written in Microsoft Visual C++ 4.0, is also available for download for those interested in seeing how it works.

USING MULTILAUNCH

Because MultiLaunch is a shell extension, it is in the form of a dynamic link library rather than an executable and must be "registered" in the Windows 95 Registry. The MultiLaunch setup program contains the DLL in compressed form and does the registration for you. When you run MULTIL.EXE, the installation program asks you where you want to install the MultiLaunch DLL (MLAUNCH.DLL). The default location is your Windows System directory, but you can store the DLL anywhere you like. Select the location, click OK and you're ready to run.

To add multiple file associations for a given file type, right-click on a file icon of that type and select the Properties menu item at the bottom of the context menu. This will bring up the Properties dialog box. In addition to the ubiquitous General tab, which provides you with information about the file size, the date it was created, and some of its attributes, you will see a MultiLaunch tab. Click on this tab to bring up the MultiLaunch association page.

Figure 2 shows the MultiLaunch association page for BOOTLOG.TXT with the associations for Notepad, Write, and Word already added. As with the standard double-click functionality, the associations apply to any filename with this extension. Therefore, all .TXT files on which you right-click will have these three new menu items in their context menus.

You can use the Add and Delete buttons to add and remove applications that are associated with this file type. Click the Add button and you will get a standard Windows 95 Open dialog box that you can use to browse for applications. When you are done making associations, click OK and you're ready to launch.

If you ever want to remove MultiLaunch from your system, you should use the Unregister MultiLaunch utility that comes with MultiLaunch (UNREGML.EXE). This will safely remove all the MultiLaunch keys from your Registry. After running UNREGML.EXE, you must reboot Windows 95 before you can delete the MLAUNCH.DLL file.

IN THIS ISSUE

MultiLaunch

MultiLaunch lets you associate more than one application with any document file type. It is a Windows 95 shell extension that you access through a file's context menu—the menu that pops up when you right-click on its icon.



INSIDE MULTILAUNCH

While Microsoft has provided some very nice enhancements to the Windows 95 user interface "out of the box," the most useful thing the company did was to allow developers to *extend* the Windows 95 user interface. Developers can add the following types of Windows 95 user interface extensions, otherwise known as shell extensions:

- Context-menu handlers add menu items to a file's context menu.
- Drag-and-drop handlers enable drag-and-drop notifications from the Windows 95 shell.
- Icon handlers provide icons for a file shown in Explorer.
- Property-sheet handlers add pages to a file's property-sheet dialog box.
- Copy-hook handlers enable notifications when a file is about to be copied, moved, deleted, or renamed.

MultiLaunch is both a context-menu handler and a property-page handler. A shell extension must be registered in the Windows 95 Registry before it can be activated. MultiLaunch adds several new entries. We'll begin our discussion by taking a look at how information is stored in the Registry.

THE WINDOWS 95 REGISTRY

The Windows 95 Registry is a hierarchical database of information about your system. Its structure is analogous to the structure of directories and files on your hard disk. A registry *key* is analogous to a directory, and a registry *value* is analogous to a file. Just like a file, a registry value has a name and some information contained within it: the registry data. Also, a registry key can contain other keys, just as a directory can contain other directories.

Windows 95 provides a tool called RegEdit (short for Registry Editor) for viewing and changing the Registry. Named REGEDIT.EXE, it can be found in your Windows directory. An icon for this program is not installed on your desktop when you install Windows 95, because the program can be dangerous to

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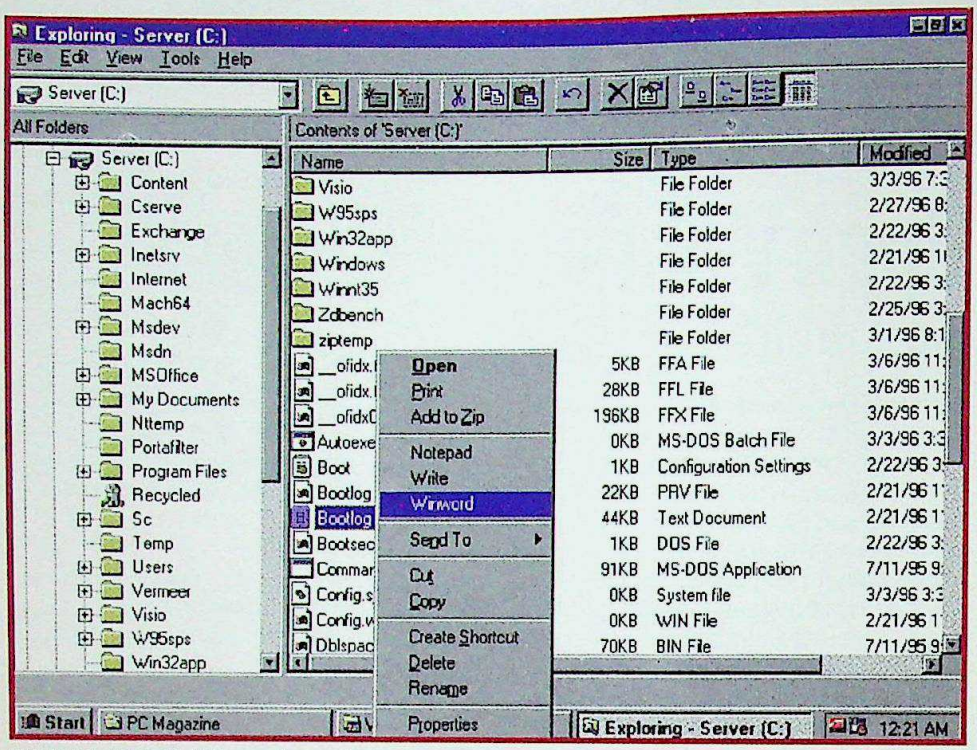


FIGURE 1: *With MultiLaunch installed, the context menu contains three new items: Notepad, Write, and WinWord. Click on any of these to open the file using that application.*

use—*make no changes to the Registry unless you know exactly what you are doing.*

When you first launch RegEdit, you'll see the top-level view of the Registry. In the left-hand pane are the top-level Registry keys; the right-hand pane displays the value for the currently highlighted key. The six main branches of the Registry you see displayed on the left are:

- HKEY_CLASSES_ROOT, which points to a branch of HKEY_LOCAL_MACHINE that holds essential user interface information such as OLE and association mappings.
- HKEY_CURRENT_USER, which points to a branch of HKEY_USERS for the currently logged in user.
- HKEY_LOCAL_MACHINE, which stores hardware and software settings for the machine itself.
- HKEY_USERS, which contains setup and configuration information for all users who log on to the computer.
- HKEY_CURRENT_CONFIG, which points to a branch of HKEY_LOCAL_MACHINE and holds information about the current configuration of the hardware.
- HKEY_DYN_DATA, which contains dynamic Plug and Play information.

Windows 95 shell extensions are implemented as OLE objects, so the first step in registering MultiLaunch is to register it as an OLE object. The HKEY_CLASSES_ROOT branch of the Registry is the place for this registration. To register an OLE object, you need a GUID (globally unique identifier), a 128-bit number that uniquely identifies the object. Developers can obtain unique GUIDs directly from Microsoft or by running a GUID-generating utility. Microsoft VC++ ships with a utility called GUIDGEN.EXE that I used to obtain the identifier. When the GUID is converted into string form, it is called a CLSID (Class ID). MultiLaunch's CLSID is 3D61D3C2-7036-11CF-B097-C080C7410B7E.

The key that registers MultiLaunch as an OLE object is shown in Figure 3. The full hierarchy isn't visible in the window, but the current registry key is

```
\MyComputer\HKEY_CLASSES_ROOT\CLSID\
➥{3D61D3C2-7036-11CF-B097-C080C7410B7E}
```

The key that defines MultiLaunch as an OLE object has this CLSID as its name and a description of MultiLaunch's purpose as its default value (displayed in the right-hand pane). It also has two subkeys: InProcServer32 and ProgID. One value of the InProcServer32 key identifies the location of the .DLL that contains MultiLaunch. The other specifies that MultiLaunch uses a programming style called the "Apartment threading model." This programming style is common to all OLE objects. The ProgID subkey has as its default value a human-readable programmatic ID for MultiLaunch.

Once the MultiLaunch OLE object is registered with the system, two more keys must be inserted to register it as a context-menu handler and as a property-sheet handler. Figure 4 shows the context-menu entry. It consists of a subkey added to the ContextMenuHandlers key. The name of the subkey is MultiLaunch.1, which is the programmatic ID of the MultiLaunch object. And the key's default value is the CLSID string for MultiLaunch. Before Windows 95 displays a file's context menu, it checks the subkeys of the ContextMenuHandlers key. Each subkey provides the CLSID of the corresponding object, and Windows 95 checks the entry in HKEY_CLASSES_ROOT\CLSID that matches the CLSID to get the location of the .DLL that implements the object. A similar entry under the PropertySheetHandlers key makes MultiLaunch available as a property-sheet handler.

Next we need to establish a connection between a particular file extension and one or more associated programs via MultiLaunch. The Windows 95 Registry contains keys for filename extensions that have been registered by applications or by the user. These keys are found directly under HKEY_CLASSES_ROOT and they all begin with a period. MultiLaunch stores its associations for a file extension below the extension's key in a subkey named MultiLaunch. The names for this key's values get added to the context menu; the data string corresponding to each value is the full path name of the program to be launched.

Figure 5 shows how MultiLaunch stores associations in the MultiLaunch subkey of the .TXT key. When a user interacts with MultiLaunch's Property Page to add a new association, MultiLaunch will create a new registry value under the MultiLaunch subkey for the filename extension. If the extension did not already have a file association, MultiLaunch will create the extension key as well.

MultiLaunch needs to enumerate the values of a Registry key under several different circumstances. To handle this efficiently, I created a helper class called CRegistryKey that, upon initialization, reads a given key's values into a handy linked list. When you construct an instance of CRegistryKey, you pass its constructor a valid registry key. CRegistryKey

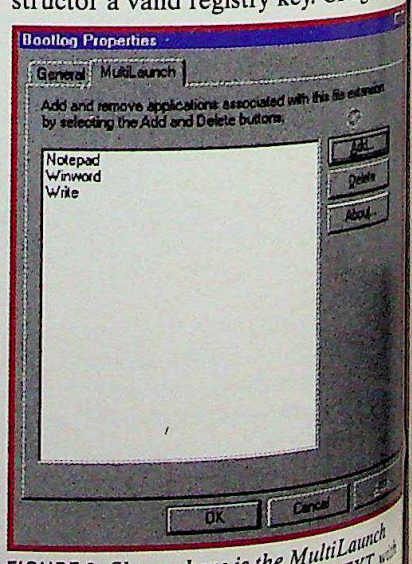


FIGURE 2: *Shown here is the MultiLaunch association page for BOOTLOG.TXT, with the associations for Notepad, Write, and WinWord already added.*

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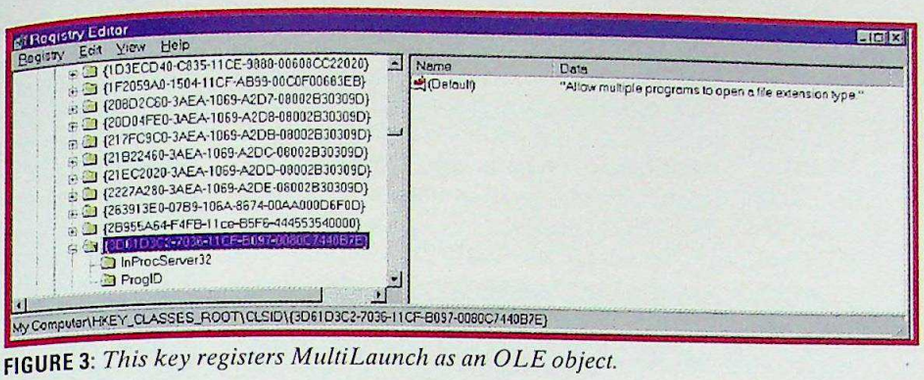


FIGURE 3: *This key registers MultiLaunch as an OLE object.*

umerates all of the reg-
ry values under this
y and stores them in-
ally using MFC's
bList linked list ob-
ct. For each registry
lue that CRegistryKey
umerates, it constructs
new CRegistryValue
ject on the heap and
tializes it to the reg-
ry value's name and
e registry value's data.

When you wish to enumerate the registry values stored in CRegistryKey, you simply call CRegistryKey::GetNext to obtain a pointer to each CRegistryValue object. If you examine the functions CShellExtension :: QueryContextMenu, CShellExtension::InvokeCommand, and CML Page::OnInitDialog, you can see CRegistryKey in action.

INDOWS 95 SHELL EXTENSIONS

When Microsoft released Windows 3.1, it popularized the term OLE (Object Linking and Embedding) to describe the interprocess communication standard that lets you store one document inside another. In Windows 95, OLE is implemented by way of a lower-level standard called COM (Component Object Model). The terms *OLE interface* and *COM interface* are often used interchangeably, but COM interface is more accurate and is the term I will use here.

Windows 95 uses COM to communicate with its shell extensions; all shell extensions are COM objects. Basically, COM defines a set of *interfaces,* or standard ways for objects to communicate with each other. Every COM object includes the basic interface IUnknown, which includes among its features a method for querying the object about any other interfaces it may provide. Each interface has an associated v-table (virtual function table) that holds the addresses of the methods for this interface. Implementation of these methods is the responsibility of the developer creating the COM object.

Windows 95 uses several COM interfaces to communicate with shell extension COM objects. MultiLaunch implements three of them: IShellExtInit, IContextMenu, and IShellPropSheetExt. The first, IShellExtInit, must be exposed by all property-sheet, context-menu, and drag-drop handlers. IShellExtInit has a single method, Initialize, which is called by the Windows 95 shell to initialize the handler. For property-sheet and context-menu handlers, the Initialize method receives a list of selected files. If this list includes more than one file, MultiLaunch cancels the initialization.

The IContextMenu interface must be exposed by all context-menu handlers, and MultiLaunch is a context-menu handler. As required, MultiLaunch implements the three methods specific to an IContextMenu interface: QueryContextMenu, InvokeCommand, and GetCommandString. The QueryContextMenu function is called by the Windows 95 shell when the user right-clicks on a file. MultiLaunch initializes the context-menu in this function. The InvokeCommand function is called when the user clicks on a menu item that was created by the QueryContextMenu

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function. The GetCommandString can be used to provide a help string for each menu item, among other things. However, an IContextMenu interface is permitted to implement GetCommandString as a do-nothing method, and that's what MultiLaunch does.

The remaining COM interface that MultiLaunch implements is related to its role as a property-sheet handler. The IShellPropSheet interface defines two methods: AddPages and ReplacePage. AddPages is called by the Windows 95 shell to add one or more pages to the property sheet. MultiLaunch creates and adds just one property-sheet page. ReplacePage is used only for control-panel object properties, so MultiLaunch implements it simply to return an error code.

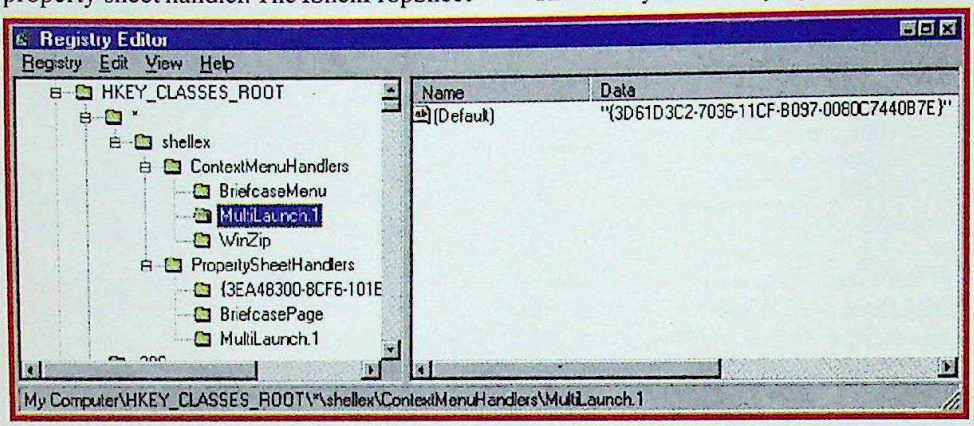


FIGURE 4: *The key highlighted here registers MultiLaunch as a Windows 95 shell extension.*

LAUNCHING AN ASSOCIATED APPLICATION

Next we'll look at how these interfaces enable MultiLaunch to perform its job. When a user right-clicks on a file, the Windows 95 shell checks the Registry for context-menu handlers and creates an instance of each one that it finds, including MultiLaunch. Windows 95 loads MLAUNCH.DLL into memory and calls the function DllGetClassObject, which must be exported by every DLL that implements one or more COM objects.

Windows 95 passes MultiLaunch's Class ID as a parameter to this function to indicate which object it wants. DllGetClassObject then creates an instance of a MultiLaunch class called CClassFactory. All COM objects need an associated "class factory" to construct additional instances of themselves. Once Windows has a pointer to the CClassFactory object, it can call the object's CreateInstance method to create any number of MultiLaunch objects.

Immediately after creating the MultiLaunch object, Windows calls the Initialize method of its IShellExtInit interface. If the list of selected files passed to this method contains more than a single file, MultiLaunch returns a failure code. Otherwise it stores the passed filename.

You might be thinking: How can there be several MultiLaunch objects present in memory at one time? This can happen if a user right-clicks on a file and brings up MultiLaunch's property page for that file, and then right-clicks on *another file* and brings up its MultiLaunch property page. In this case, two MultiLaunch objects would be present in memory at one time.

The activity initiated by right-clicking on a file continues with the creation of the context menu for that file. Windows 95 calls the QueryContextMenu method of the IContextMenu interface of MultiLaunch when it creates a new context menu. When it is dispatching commands that the user selects from the menu, it calls the InvokeCommand method of that interface.

All the interface methods described above are defined in MultiLaunch's source code as methods of a single object type, CShellExtension. CShellExtension is defined by MultiLaunch as multiply inheriting from the three standard COM objects IShellExtInit, IContextMenu, and IShellPropSheetExt. The member function CShellExtension::QueryContextMenu handles menu creation, and CShellExtension::InvokeCommand handles dispatching of commands from the context menu.

Both these methods create a new instance of a CRegistryKey object on the stack, passing it the registry key for the filename that the user has selected. Remember, CRegistryKey is a helper object defined within MultiLaunch to handle enumerating Registry keys. The QueryContextMenu method looks up the MultiLaunch key associated with the selected file's extension and adds the association subkeys it finds to the context menu.

When the Windows 95 shell calls InvokeCommand, it passes the command ID, which is a 0-based index into the context menu items created earlier by QueryContextMenu. InvokeCommand looks up the registry value in the CRegistryKey object using the GetAt member function that returns a pointer to a CRegistryValue object. The m_strValue member variable of CRegistryValue contains the path to the application, and m_strFilename contains the filename selected by the user. InvokeCommand then simply calls WinExec to launch the application:

```
strCommandLine = pRegistryValue->m_strValue + " " +
strFilename;
WinExec(strCommandLine, SW_SHOWDEFAULT);
```

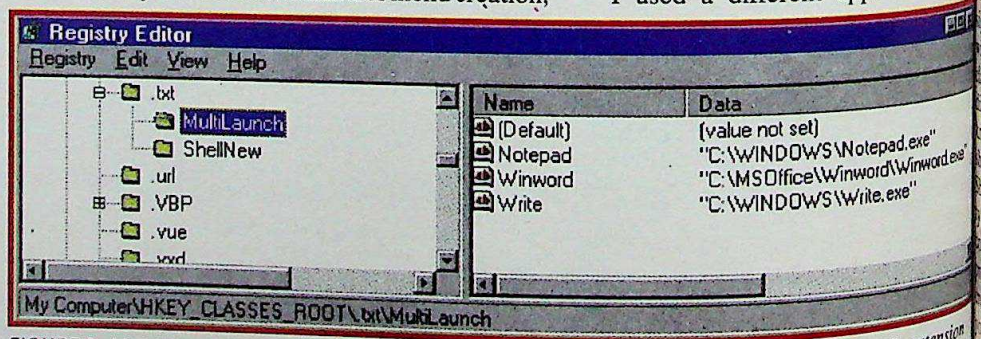


FIGURE 5: *MultiLaunch stores associations in a MultiLaunch subkey under the relevant file extension key. When a user adds a new association, it adds a new Registry value for that subkey.*

A SLICK WAY TO IMPLEMENT COM

MultiLaunch is an MFC application, but doesn't use the standard MFC method of implementing COM interfaces for one simple reason—they're clumsy! As explained earlier, a MultiLaunch object is really a CShellExtension object. CShellExtension must therefore implement the three COM interfaces supported by MultiLaunch: IShellExtInit, IContextMenu and IShellPropSheetExt. The way this is handled in MFC is by creating nested classes under CShellExtension that each contain v-tables for the interfaces. Since MultiLaunch's data is contained in the parent class, much tedious code must be written to maintain the parent/child relationship properly.

I used a different approach in MultiLaunch. Instead of creating nested classes within CShellExtension, I used the multiple inheritance feature of C++ to obtain access to all three interfaces within the CShellExtension class itself. Multiple inheritance in C++ lets you override the implementation in an ancestor but still call the implementation in an ancestor call if you choose. The class declaration for CShellExtension is

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```
class CShellExtension : public ➥IShellPropSheetExt,
➥IShellExtInit, ➥IContextMenu
```

With this elegant solution, I can use one v-table for all three interfaces simply by using a typecast. When you typecast a pointer to CShellExtension into one of its ancestor classes, C++ creates a v-table that is compatible with that ancestor class and populates it. In essence, multiple inheritance creates a v-table union, and casting populates the shared v-table with the appropriate set of methods. I simply typecast the implicit C++ **this** pointer into one of CShellExtension's base classes when I need to create one of those interfaces!

You can see this in action by looking at the implementation of CShellExtension::QueryInterface function (see Figure 6). Through the typecasting trick mentioned in the previous paragraph, QueryInterface elegantly exports all four of the interfaces supported by MultiLaunch. This is a much cleaner implementation than the MFC solution, which requires using nested classes.

MFC AND WINDOWS 95 SHELL EXTENSIONS

One of my goals for this utility was to show how you can use MFC to create a Windows 95 shell extension. While the existence of MultiLaunch shows that it is certainly possible to do so, it wasn't quite that easy to create the first time! In particular, getting CPropertyPage to work correctly was the source of a lot of grief.

CPropertyPage is an MFC-derived class that handles all the user interface interaction required by the MultiLaunch property page. It contains the code that adds and deletes registry entries for MultiLaunch associations. CPropertyPage was designed to work in conjunction with CPropertySheet, the MFC class that handles the Properties dialog box. CPropertyPage knows how to communicate and share data with CPropertySheet—an MFC-created property sheet—but if you want it to communicate with a non-MFC property sheet, such as one that is created by the Windows 95 shell, you have to pass it the necessary information.

The standard Windows API method of communicating this information is to use DialogProcs and fill in many convoluted Win32 API structures. This method works fine but it's tedious, so I wanted to try to implement it using MFC. I had problems, however. To discover how to make it work, I had to delve deep into the mechanics of how MFC handles property pages.

THE TOP 10 UTILITIES

1. **STRING** Batch file enhancer
2. **WARPCA** OS/2 file cabinet
3. **APPOIN** Windows appointment book
4. **ZDROP** Drag-and-drop unzipping
5. **FDDLLS** Finds dead DLLs
6. **SPAD** Enhanced Windows Notepad
7. **WINBAR** Taskbar for Windows 3.1
8. **INCTR2** Monitors program installation
9. **WMATCH** Compares directory contents
10. **1MBF** Protects low memory

When you create a CPropertyPage object, the actual window that is the Property Page has not yet been created. But MFC needs to know the value of the window handle for the property-page window. This is because MFC uses a single DialogProc called AfxDlgProc to handle message dispatching to all MFC-created dialog boxes. AfxDlgProc does a dynamic lookup using the hWnd of the window's message to obtain a pointer to the CDialog-derived object that is supposed to handle the message. To get the window handle of a window that doesn't yet exist, MFC sets a CBT (Computer-Based Training) hook that sends notification messages to MFC every time a window is created on the system. In the handler for the CBT hook, MFC checks to see if the window created is an MFC window, and if so, it informs the CDialog-derived object of its window handle when the window is created.

To create a property page, Windows 95 uses a PROPSHEETPAGE structure. There is a pointer to a DialogProc in the PROPSHEETPAGE structure and also a pointer to a callback function that receives notifications from Windows when the property page is actually created or destroyed. MFC uses the callback function to set a CBT hook to watch for the creation of the property-page window. To know which CPropertyPage object's window is being created, MFC uses the PROPSHEETPAGE lParam member variable to store a pointer to the CPropertyPage object that "owns" that property page. When Windows calls the property page callback function, it passes it a pointer to the PROPSHEETPAGE structure for the property sheet being created or destroyed. By looking at the PROPSHEETPAGE lParam member variable, MFC can find the CPropertyPage object that owns that property page.

When I reached this point in my investigations, I found the first bug that was preventing my code from working. Unfortunately, I happened also to be using lParam to store a pointer to the filename that the user clicked on in Explorer. Whoops!

I also found one additional twist. When Windows destroys the property sheet object that it created , it also destroys all of its associated property pages. However, Windows doesn't tell the CPropertyPage object to destroy itself. That's my job. Surprise! If I didn't do this, I would have a memory leak. To perform this task, I hook into the property page callback function and wait for the notification message PSPCB_RELEASE. When I receive this message, I look up the pointer to my CPropertyPage object in the PROPSHEETPAGE lParam member variable and use this pointer to destroy it. This is

```
STDMETHODIMP CShellExtension::QueryInterface (REFIID riid,
➥LPVOID* ppvObj)
{
  *ppvObj = NULL;
  HRESULT hr = E_NOINTERFACE;

  if (riid == IID_IUnknown) {
    *ppvObj = (LPUNKNOWN) (LPSHELLPROPSHEETEXT) this;
    hr = NOERROR;
    m_cRef++;
  }
  else if (riid == IID_IShellPropSheetExt) {
    *ppvObj = (LPSHELLPROPSHEETEXT) this;
    hr = NOERROR;
    m_cRef++;
  }
  else if (riid == IID_IShellExtInit) {
    *ppvObj = (LPSHELLEXTINIT) this;
    hr = NOERROR;
    m_cRef++;
  }
  else if (riid == IID_IContextMenu) {
    *ppvObj = (LPCONTEXTMENU) this;
    hr = NOERROR;
    m_cRef++;
  }
  return hr;
}
```

FIGURE 6: *By using multiple inheritance and typecasting, QueryInterface elegantly exports all four of the interfaces supported by MultiLaunch.*

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the role of the PropPageCallback function in MultiLaunch.

BUILD YOUR OWN SHELL EXTENSIONS

Feel free to use the code in MultiLaunch to build your own shell extensions. Most of the housekeeping regarding registering and unregistering your shell extension is taken care of for you by my implementation of DllRegisterServer and DllUnregisterServer. Just modify the member functions of CShellExtension to suit the shell extension that you are creating. If you use my implementation of CShellExtension::AddPages in your shell extension, you'll have the flexibility of being able to use CPropertyPage and all of MFC's property page support in your shell extension.

MultiLaunch uses the extensibility of the Windows 95 shell to enhance the operating system's file extension association feature. It also demonstrates some cool programming tricks. Hopefully, it will make your life easier. Enjoy!

FURTHER READING

Here are a few references for further information about Windows 95 shell extensions, and COM/OLE in general:

- *Mastering OLE,* by Bryan Waters, Sybex 1995: A good general introduction to COM/OLE.
- *Inside OLE,* Second Edition, by Kraig Brockschmidt, Microsoft Press, 1995: An in-depth treatment on COM/OLE. This is a good source of further reading on using multiple inheritance for creating multiple interfaces for a single COM object.
- Technical Note #38: Microsoft Developer Network: A description of how MFC uses nested classes to implement multiple interfaces on a single COM object.
- *Programming the Windows 95 User Interface,* by Nancy Winnik Cluts, Microsoft Press, 1995: An overview of writing applications that exploit the Windows 95 user interface features, such as the new common controls and shell extensions.
- MSDN Technical Articles: MFC/COM Objects Part 5: Using Multiple Inheritance, by Nigel Thompson. A description of how the Cairo group at Microsoft uses multiple inheritance to create COM objects. □

John Lam is the director of software development for Continuum Research, a company that specializes in creating OLE- and OCX-based tools for developers.

GUIDE TO OUR UTILITIES

ABOUT MULTILAUNCH...

DESCRIPTION MultiLaunch lets you associate more than one application with a file extension. It is a Windows 95 shell extension that you access through a file's context menu—the menu that pops up when you right-click on its icon. MultiLaunch adds a section to the context menu that lists programs you can use to load the document. It also adds a page to every file's property sheet that lets you configure the list of programs to use with this type of file.

USAGE Since MultiLaunch is a shell extension, it is in the form of a dynamic link library rather than an executable, and it must be "registered" in the Windows 95 Registry. The MultiLaunch setup program contains the DLL in compressed form and does the registration for you. When you run SETUP.EXE, the installation program will ask you where you want to install the MultiLaunch DLL (MLAUNCH.DLL). The default location is your Windows system directory, but you can store the DLL anywhere you like. Select the location, click OK, and you're ready to run.

To add multiple file associations for a given file type, right-click on a file icon of that type and select the Properties menu item at the bottom of the context menu. This will bring up the Properties dialog box. In addition to the ubiquitous General tab, which provides you with standard file information such as the size and creation date, you will see a MultiLaunch tab. Click on this tab to bring up the MultiLaunch association page. When you add an association to a file's context menu, the association applies to all files with the same extension.

You can use the Add and Delete buttons to add and remove applications that are associated with this file type. Click the Add button and you will get a standard Windows 95 Open dialog box that you can use to browse for applications. When you have finished making associations, click OK, and you're ready to launch.

If you want to remove MultiLaunch from your system, use the Unregister MultiLaunch utility that comes with MultiLaunch (UNREGML.EXE). This will safely remove all the MultiLaunch keys from your Registry. After running UNREGML.EXE, you must reboot Windows 95 before you can delete the MLAUNCH.DLL file.

SUPPPORT Help for *PC Magazine*'s utilities can be obtained electronically in the Utilities section of ZD Net's Tips Forum (GO ZNT:TIPS). The authors of current utilities generally visit this forum daily. You may find an answer to your question simply by reading the messages posted in the forum. If the author is not available and the forum sysops can't answer your question, the Utilities column editor, who also checks this forum each day, will contact the author for you.

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Visible Errorlevels in Windows 95

Many batch files make decisions based on the errorlevel returned from a program. The errorlevel values that may be returned are generally described in the program documentation or the MS-DOS user manual. In Windows 95, however, COMMAND.COM has an undocumented /Z switch that causes it to display the errorlevel returned by every DOS program you run. If you're a batch file programmer, I think you'll find this switch to be very handy.

RUBEN CHENG, *Valencia, Venezuela*

PC MAGAZINE: This is a useful tip. Mr. Cheng originally suggested adding the /Z switch to the SHELL= line in CONFIG.SYS, but errorlevel reporting is not a feature you'll want turned on all the time. When you're developing batch files in an MS-DOS window, however, enter the command COMMAND /Z. Now you're operating under a secondary command processor that reports the errorlevel for each DOS program, as Figure 1 illustrates. To return to normal operation, simply enter the EXIT command.

```
E:\WIND95>command /z

Microsoft(R) Windows 95
  (C)Copyright Microsoft Corp 1981-1995.
Return code (ERRORLEVEL):  0
WARNING: Reloaded COMMAND.COM transient

E:\WIND95>choice Which do you choose /C:ABC
Which do you choose [A,B,C]?C
Return code (ERRORLEVEL):  3

E:\WIND95>ECHO Fools rush in | find /i "foo"
Fools rush in
Return code (ERRORLEVEL):  0

E:\WIND95>ECHO ... where angels fear to ➥tread | find /i "foo"
Return code (ERRORLEVEL):  1
```

FIGURE 1: *Unsure what errorlevels a DOS program returns? Run it under Windows 95's command processor invoked with the /Z switch and find out!*

Identifying UFOs (Unidentified File Objects)

We've all faced the daunting prospect of weeding our WINDOWS and SYSTEM directories of DLLs left from software we no longer use. The PC Magazine *utility FD-DLLS can help find DLLs that aren't being used, but it doesn't tell you much about them. Since a DLL's module definition string can often tell you what function the DLL performs or what software it was a part of, I wrote WHATISIT.COM to display the information.*

Sometimes the string is just a copyright notice or a repeat of the program's .EXE filename, but more often the string is a bit more descriptive. Microsoft is usually pretty good at using this string for descriptive information. For example, using WHATISIT on COMMDLG.DLL (bundled with Windows 95) produces the string "Common Windows Dialogs, Ver. 4.00." The same task can be done in QBasic (Figure 2), but the QBasic program can't read parameters on the command line.

I found out about this when a user needed to identify a screen saver by reading the information from the .SCR file itself. He needed both the section name used to store its settings in the CONTROL.INI file and the name as displayed in Control Panel. After digging around in the Windows SDK, I discovered that the section name is one of the screen saver's resource strings, and the name displayed in Control Panel comes from the screen saver's module definition string. It turns out the module definition string is a required component of all Windows executable files (.SCR, .EXE, .DLL, .DRV, .VBX, .QTC, .FON, and so forth), and it can be useful for identifying the nature of the file.

GREGORY A. WOLKING, *Orlando, Florida*

PC MAGAZINE: The WHATISIT program, both the .COM and .BAS versions, works specifically on Windows 3.1 executable files, so it starts by

HIGHLIGHTS

HARDWARE Find out your options if you want to add a CD-ROM drive to a system that already contains two IDE hard disks. *Page 101*

OPERATING ENVIRONMENTS OS/2's ability to let you change the size of a program object's window means that your DOS boxes can be any size you like! *Page 102*

WORD PROCESSING There is a way to set WordPerfect 6 for DOS's Print/Fax screen so that it will print just a single page. *Page 103*

OUR ADVISORS

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```
'WHATISIT.BAS
'Program to display the Module Definition String
'from a Win 3.x executable file (.EXE, .SCR, .DLL, etc.)

  INPUT "File to examine"; f$
  OPEN f$ FOR BINARY ACCESS READ AS #1
  IF LOF(1) = 0 THEN GOTO NoExist
  IF LOF(1) < &H2F THEN GOTO ErrorExit
  SEEK #1, &H3C + 1
  GET #1, , wh%      'Get offset to Windows header,
  SEEK #1, wh% + 1   'which should begin with "NE"
  a$ = INPUT$(2, 1)
  IF a$ = "PE" THEN GOTO ThirtyTwo
  IF a$ <> "NE" THEN GOTO ErrorExit
  wh% = wh% + &H2C   'DWORD at offset 2CH points to
                     'nonresident name table
  IF wh% >= LOF(1) THEN GOTO ErrorExit
  SEEK #1, wh% + 1
  GET #1, , rn&
  IF rn& >= LOF(1) THEN GOTO ErrorExit
  SEEK #1, rn& + 1   'First is Module Definition
                     'String.
  l$ = INPUT$(1, 1)      'Read lenth byte.
  a$ = INPUT$(ASC(l$), 1) 'Read string data
  PRINT a$               ' and display it
  CLOSE
  END
NoExist:
  PRINT "File is non-existent or zero-length."
  CLOSE
  END
ThirtyTwo:
  PRINT "Not compatible - 32-bit executable file."
  CLOSE
  END
ErrorExit:
  PRINT "Not a Win 3.1 executable file."
  CLOSE
  END
```

FIGURE 2: *This QBasic program extracts and displays a descriptive string from any Windows 3.1 program or DLL.*

making sure the selected file is the correct type. It opens the file and reads the 2-byte value at offset 3Ch—this should be the offset of the New Executable header within the file. Then it seeks to the specified offset and reads two more bytes. The 2-byte signature at the start of the New Executable header should be the characters NE.

If this process fails anywhere along the line, WHATISIT reports that the file is not a Windows 3.1 executable and quits. If the file is of the correct type, WHATISIT reads the 4-byte value at offset 2Ch within the New Executable header. This value is the offset of the nonresident name table within the file. The first entry in the nonresident name table is, as Mr. Wolking notes, the module definition string preceded by the string's length. WHATISIT extracts this string from the file, prints it, and quits.

The strings WHATISIT returns can be quite informative; for example, CHARMAP's is "Utility for easily selecting special characters," and the string for CALC states "Microsoft Calculator: Developed by Kraig Brockschmidt." Even more useful are the descriptive strings within .DLL files. It's handy to know that MSAFINX.DLL is a "DLL of financial functions and other stuff" and that BIVBX11.DLL is the "Borland VBX Emulation Library."

You can download WHATISIT.COM, WHATISIT.BAS, and the commented DEBUG script from PC Magazine Online.

Rehang Your Wallpaper

I recently came across a pair of settings for the [Desktop] section of the WIN.INI file in Windows 3.x that let me reposition my wallpaper bitmap anywhere on my screen instead of in the default center position. They are "WallPaperOriginX" and "WallPaperOriginY". With values greater than 0, these two settings let you specify the location of the upper-left-hand corner of your wallpaper bitmap. For example, the following two lines let you place your bitmap at the upper-left-hand corner of your screen:

```
WallPaperOriginX=1
WallPaperOriginY=1
```

You can modify the value of WallPaperOriginY alone to lower your bitmap on the desktop. For this to work, however, the bitmap should be smaller than your screen, and you should center the wallpaper in Control Panel's Desktop applet.

To position the bitmap on the right side of the display, it's helpful to know your screen resolution and the size of the bitmap in order to calculate the appropriate values (that is, the number of pixels to move the image). Or you can use the time-honored trial-and-error method.

RAYMOND CHOW, *Foxridge, Maryland*

PC MAGAZINE: Windows gives you two choices for the placement of your wallpaper bitmap. It can be tiled, in which case the image is repeated enough times to fill the screen completely, or it can be centered. But the centered style for single-image wallpaper doesn't always look good. This technique for forcing the "centered" wallpaper image to an edge or corner of the screen can yield a much better look.

Windows 95 users can take control of wallpaper position too, though the method isn't quite the same. Windows 95 retains WIN.INI and SYSTEM.INI files for certain backward-compatibility purposes, but its real repository for system settings is the Registry. Making the suggested additions to WIN.INI won't have any effect in Windows 95. Instead, carefully copy the text from Figure 3 to a file called WALLPOSN.REG. Every one of the four lines in this file is important, including the initial REGEDIT4.

Once you've saved the file, launch it by double-clicking on it in Explorer or issuing the command START WALLPOSN.REG in a DOS box. Windows 95 will respond with a message box stating that the information was successfully entered in the Registry. The change will take effect when you restart Windows or change your wallpaper bitmap.

Another setting in Windows 95 will stretch a centered wallpaper image so that it fills the screen. To activate this feature, just replace the last two lines in WALLPOSN.REG with the following:

```
"WallpaperStyle"="2"
```

Launch the modified file as before. When you restart Windows or change your wallpaper, the centered wallpaper bitmap will stretch to fill the screen. You may need to try a few different images before you're satisfied, though; not all bitmaps benefit from being stretched.

```
REGEDIT4
[HKEY_CURRENT_USER\Control Panel\desktop]
"WallPaperOriginX"="1"
"WallPaperOriginY"="1"
```

FIGURE 3: *Launch this file under Windows 95 to move a "centered" wallpaper bitmap into the top-left corner of the screen.*

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Ask Our Advisors

HARDWARE

Adding a CD-ROM Drive

I want to install a CD-ROM drive in my system, but I already have two IDE hard disks. Since an IDE controller can handle only two devices, I'm not sure how to proceed. What's the easiest and most cost-effective way to install a CD-ROM drive? Does it make sense to replace the two hard disks with a single, larger one to make room for the CD?

LARRY HOWELL, *O'Fallon, Illinois*

PC MAGAZINE: There are many ways to solve your problem, but the goal of keeping costs and hassles to a minimum helps to narrow the range of choices a bit. The best solution depends on the equipment you have now and what you intend to add in the future.

If you have a sound card, that may provide the easiest solution. Many sound cards include a port for a CD-ROM, and in many cases they will support a SCSI drive, which you can get at a reasonable cost from a variety of sources. If you don't have a sound card and are running Windows, I would strongly suggest you consider adding one along with the CD-ROM drive, since many CD applications use sound. Multimedia kits provide an affordable way to add a CD-ROM drive and sound card at the same time from a single source, and nowadays most multimedia upgrade kits tend to be easy to install and reliable.

If the sound-card solution doesn't appeal to you, your best bet is to add a second controller. You can add an IDE controller and configure it as the secondary channel so that it doesn't conflict with your primary IDE controller. A second controller offers two potential benefits over swapping your two smaller hard disks for one large disk. First, if you're running Windows 3.*x* and you put both your hard disk and the CD-ROM on the same IDE channel, you won't be able to take advantage of 32-bit disk access. And with a second controller, you'll end up with an extra IDE connection available, in case you want to add a third hard disk or other IDE device in the future.

If it's likely that in the near future you'll add several devices, such as a scanner or removable hard disk, you may want to choose a SCSI controller instead. SCSI controllers cost well under $100 and offer the advantage of letting you connect up to six additional devices besides the CD-ROM drive. This approach may cost a few dollars more than using a secondary IDE controller, but it will leave you with the most flexibility for future additions.

—*Alfred Poor*

Coprocessor Conflict

I have a 386DX/33 computer that I want to use for a CAD program. I recently tried to install a math coprocessor to speed performance, but I had nothing but trouble. The installation seemed to go smoothly enough, and a utility that came with the chip indicated that everything was fine. But every time I try to run Windows, it eventually crashes. Sometimes I can actually start to load an application, while other times Windows can't even finish loading Dashboard. When I removed the math coprocessor, my system returned to normal, but when I reinstalled the chip, it again brought the system to a halt. I even tried exchanging the coprocessor for a different brand, but the newer one didn't even let the system get to the DOS prompt.

I'm stumped. I've double- and triple-

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checked the settings on the motherboard and the installation looks fine. So, why won't it work?

BEN ALEXANDER,
Olympia, Washington

PC MAGAZINE: Hardware conflicts are a likely source of your difficulties. Math coprocessors use IRQ 13, and it's quite possible that a piece of hardware already installed on your system is also assigned to that IRQ. Your letter does not mention what other hardware, if any, you've installed in the system, but I'd start by stripping the system down to the bare minimum and seeing whether the problem disappears.

You can also check for IRQ conflicts by removing the math coprocessor chip and running a good diagnostics program that reports the status of your system's IRQs. If IRQ 13 is in use, determine which component is using it and try to reconfigure that component to use a different IRQ.

If you're able to eliminate a hardware conflict as the source of the problem, the next step is to check your software. In this case I'd start by getting rid of Dashboard and any unnecessary TSRs or drivers to see whether they might be the cause of the problem.
—*Alfred Poor*

OPERATING ENVIRONMENTS

Sizing a DOS Window In OS/2

I wrote a little DOS calendar program that I keep on my OS/2 desktop. The program works fine in a DOS session, but the DOS window seems much too large for my little character-mode calendar. The calendar really needs to pop up in a 16-line by 43-column window rather than in the default 21-line by 64-column window. Is there a way to get a DOS session to start with a specified window size?

PRESTON T. SPAULDING,
via CompuServe

PC MAGAZINE: There isn't a setting that specifically controls window size, but you can accomplish the same thing using a little-known technique. The first step is to create a separate desktop object for your program. It sounds as though you've already done this, but if not, drag a Program object from the Templates folder onto your desktop. A settings folder will open, prompting you for the path to the program. After entering the path, go to the Session page in the notebook and tell OS/2 to run the program in a DOS windowed session (Figure 1). Then go to the General page of the folder and assign an icon and a title to the program. Close the settings notebook and your program object will appear on the desktop.

Now double-click on the icon and the window will open to the standard size. Move the mouse pointer to a sizing corner of the window, then press and hold mouse button 2. Size the window the way you want it, but before you let go of the mouse button, hold down the Shift key. Don't let go of the Shift key until after you've let go of the mouse button. You have just changed the default window size for the program object assigned to the icon you used to start the program! (Note that this works for the plain DOS windowed command prompt as well.) Close the program and OS/2 will store the new window size for this program object. The next time you open the program from that icon, your calendar will appear in a window set to the size you specified.—*Brian Proffit*

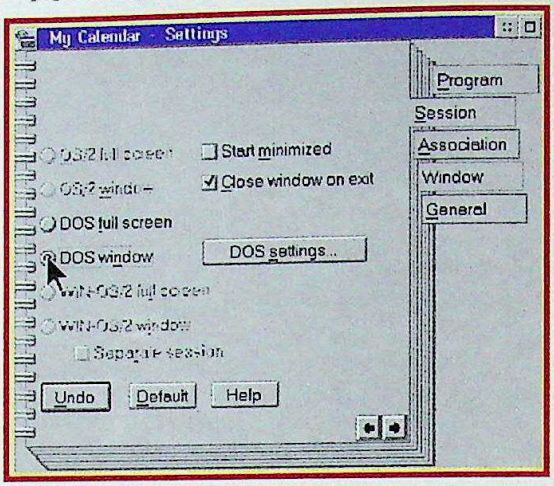


FIGURE 1: *Setting up a DOS program to run in a windowed OS/2 session.*

Limiting Users to One Windows Program

Within the next few weeks, I will begin teaching some coworkers how to use CorelDraw. During the training period we'll be sharing my computer, but I don't want them to use my other Windows applications when I'm not at my desk. Is there any way I can prevent these users from accessing my other applications, yet allow them to use CorelDraw?

JOSE CELORIO, *Woodlands, Texas*

PC MAGAZINE: Here's what you do. Open SYSTEM.INI in your favorite text editor and find the line that begins with SHELL=. In Windows 3.1, the default is "SHELL=progman.exe"; in Windows 95, it's "SHELL=explorer.exe". Duplicate the line and put a semicolon in front of the first copy (the semicolon turns this line into a comment). On the line without the semicolon, replace the default program name with the full pathname of your CorelDraw program.

When you restart Windows, it will run CorelDraw and only CorelDraw. The Startup group or menu won't be processed, programs on the LOAD= and RUN= lines in WIN.INI won't be launched, and any program name specified on the Windows 3.1 WIN.COM command line will be ignored. And of course your users will have no way to start another program.

Windows 3.1 will shut down automatically when your users terminate Corel Draw, but Windows 95 will not. To shut down Windows 95, you'll have to press Ctrl-Alt-Del to bring up the Close Program dialog box and then press the Shut Down button.

To restore Windows to full function for your own use, open SYSTEM.INI again and find the two SHELL= lines. Remove the semicolon preceding the original line and insert a semicolon at the start of the copy. That's a simple task in Windows 3.1, because once you exit Windows you're at the DOS prompt.

If you've configured Windows 95 to run just a single program, restoring a normal configuration takes a tiny bit more work. As the system is booting up, the words "Starting Windows 95..." will appear on the screen for a few seconds. Press the F8 key as soon as they show up. In the ensuing Windows 95 startup menu, select the "Command prompt only" option. Edit SYSTEM.INI to restore the original SHELL= line, then type WIN to start Windows 95.—*Neil J. Rubenking*

Timesharing for Windows NT Command Prompts

I recently installed Windows NT 3.5, and I can't figure out why a simple test doesn't produce the expected results. The test consists of starting two DOS sessions and entering DIR /P from the root of my C: drive at the same time. I expected both sessions to be active at the same time and scroll simultaneously. Instead, only the active window processes, while the background window is stopped. Isn't Windows NT a multitasking operating system? Is there some setting I need to change to obtain the desired result?

K. S. KALIRAI, *via the Internet*

PC MAGAZINE: Windows NT is definitely a multitasking system, and in fact your two command-prompt sessions are running simultaneously. Make a Windows application such as Program Manager the foreground task, and you'll see that both background command-prompt windows scroll at about the same rate. In your experiment, the background task

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seems stuck, because by default Windows NT gives the foreground task as much processor time as it demands. There are settings you can adjust to change the multitasking behavior, however.

Launch Windows NT's Control Panel and double-click the System applet. Press the Tasking button in the resulting dialog. You will be presented with three choices:

- Best Foreground Application Response Time
- Foreground Application More Responsive Than Background
- Foreground and Background Applications Equally Responsive

The first option is the default, because most users want the foreground task to operate as quickly as possible. If you choose the second option, the background tasks get a bigger slice of the CPU pie, but not enough to change the result of your experiment. Only if you choose to give all tasks equal shares of CPU time will you see foreground and background command-prompt sessions scrolling through a long directory listing at the same speed.

But changing the tasking priorities for the whole system will affect the performance of all programs, not just your experimental command prompts. There's another way to conduct your experiment without changing the whole system's performance. Choose Run from the Windows NT Program Manager's File menu and enter this command:

```
cmd /c START /LOW dir c:\/s
```

Press OK and immediately run this same command again using the File | Run dialog's pull-down history list. Both instances scroll at about the same speed, because the START command's /LOW parameter has set both tasks to low priority.—*Neil J. Rubenking*

WORD PROCESSING

Changing the Size of Ami Pro's Opening Window

Ami Pro 3.1 always starts with a full-screen window, but I prefer a smaller window since I use a 17-inch monitor. This means I have to resize the window each time I open the program. Is there a way to have Ami Pro start with a particular window size each time?

CHARLES CESARINI,
Hampton, New Hampshire

PC MAGAZINE: A four-line macro will do the trick. First, decide how large you want the window, as a percentage of the screen size. For example, you might want it to be 80 percent of the screen width—large enough to hold a full line of text—and 100 percent of the height—so you can see as much text on the screen as possible. Then choose File | New to open a new file and create the following macro:

```
FUNCTION SIZE()
AppSize("",80,100)
AppMove("",0,0)
END FUNCTION
```

The FUNCTION and END FUNCTION statements are required in every macro. This particular function statement defines the function name as Size. The AppSize and AppMove commands do the work. The empty sets of double quotes in each command tell Ami Pro that the commands apply to the Ami Pro window. (More precisely, the text between double quotes tells Ami Pro which program the command applies to—no text between the quotes indicates that the command applies to the Ami Pro window itself.)

The two numbers in the AppSize command set the window at 80 percent of the screen width and 100 percent of the height. The numbers in the AppMove command define the position for the upper-left corner of the window—0,0 in this case, the upper-left corner of the screen. You can, of course, modify these numbers to match your needs.

Save the macro by choosing File | Save and set the file type to Ami Pro Macro, choosing an appropriate name such as Size. Then select Tools | User | Setup, go to the Run Macros box, make sure the Program Load check box is checked, and enter the macro name as the macro to run on start-up. (If you already have a macro that runs when you load the program, you can simply add the AppSize and AppMove commands to it instead of creating a new macro.)

Note that Lotus Word Pro 96, the successor to Ami Pro, pretty much eliminates the need for an equivalent macro. If you choose File | User | Setup | Word Pro Preferences, then go to the General card, you'll see the option Load Word Pro Maximized. Remove the check from the check box and Word Pro will remember the window size from the last time you closed the program and return to that size when you reopen it.—*M. David Stone*

Changing Dialog Box Defaults in WordPerfect 6 for DOS

The Print/Fax screen in WordPerfect 6 for DOS seems to be set in concrete for printing a full document. Is there any way to change the default from Full Document to Page?

GEORGE W. SMEJKAL,
Kilmarnock, Virginia

PC MAGAZINE: Although there isn't any option you can set to change the default, you can get the same result with a short, simple macro:

```
DISPLAY(On!)
DLGInput(On!)
PrintDlg
Type("p")
```

For this particular macro, you can actually leave out the first line (it ensures that the macro's actions will display on the screen). I've included it primarily as a reminder, should you want to use this technique to change a setting in a dialog box as part of a longer macro. WordPerfect ordinarily adds the command DISPLAY(Off!) to the beginning of each macro that you record, and it's usually a good idea to leave it there so the macro can do its work without updating the screen at each step. But in this case, you need to see the Print/Fax dialog box, and that means you need DISPLAY set to on. In a longer macro you'll want to add the DISPLAY(On!) command just before you open the dialog box.

The second line, DLGInput(On!), lets the macro accept the Type command (two lines down) to change the setting to Page. The third line, PrintDlg, opens the Print/Fax dialog box. And the final line, Type("p"), sends the character *p* to the dialog box, just as if you typed it at the keyboard. The *p* sets the dialog box to print a page.

To create this macro, press Ctrl-F10 to bring up the Record Macro dialog box, give the macro a name—ALTP would be a good choice—add an X to the Edit Macro check box, and choose OK. Then enter the macro in the editing screen and choose File | Save. To run the macro, simply press Alt-P (assuming you did indeed name it ALTP). The macro will call up the Print/Fax dialog box, set it to print a page, and wait for you to give the command to print. More generally, you can use this technique any time you want to call up a dialog box with personalized defaults.
—*M. David Stone*

DATABASES

Calculating Julian Dates in Access 95

I need a routine that automatically converts calendar dates to Julian dates and the other way around in my Microsoft Access for Windows 95 database. I tried looking through the manual, but I can't find any help.

Can you help?

GEORGE ASHLEY,
Kansas City, Kansas

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```
'*****************************************************
' Public Function DateToJulian( dtmDate )
' Access 95
' Converts the passed calendar date to a Julian date
' number.
'*****************************************************
Public Function DateToJulian(dtmDate As Date) As Long
DateToJulian = (dtmDate - #1/1/100#) + 1757585
End Function
```

```
'*****************************************************
' Public Function JulianToDate( lngJulian )
' Access 95
' Converts the passed julian date number to a calendar
' date
'*****************************************************
Public Function JulianToDate(lngJulian As Long) As Date
JulianToDate = lngJulian - 1757585 + #1/1/100#
End Function
```

FIGURE 2: *Use these functions in Access 95 to convert a calendar date to a Julian date number, or vice versa.*

```
'*****************************************************
' Public Function DateToNumericDayYear(dtmDate As Date)
' Access 95
' Converts the passed date to the numeric day of the year
' (1-366)
'*****************************************************
Public Function DateToNumericDayYear(dtmDate As Date) As Integer
DateToNumericDayYear = dtmDate - _
  DateSerial(DatePart("yyyy", dtmDate), 1, 1) + 1
End Function

'*****************************************************
```

```
' Public Function NumericDayYearToDate( intNum )
' Access 95
' Converts the numeric day of the year (1-366) to a
' calendar date
' in the current year
'*****************************************************
Public Function NumericDayYearToDate(intNum)
NumericDayYearToDate = _
  DateSerial(DatePart("yyyy", Date), 1, 1) + intNum - 1
End Function
```

FIGURE 3: *Use these functions in Access 95 to convert a calendar date to the equivalent numeric day of the year, or vice versa.*

PC MAGAZINE: The two routines in Figure 2 will help, but first let me define the term *Julian date*. According to the *Academic American Encyclopedia:* "The Julian day is the unit of a chronological system, created by Joseph Scaliger in 1582, in which any day is measured by counting the number of days from an arbitrary zero day, Jan 1., 4713 B.C., at noon, Greenwich time. It is now used mostly in astronomy to calculate the number of days between two widely separated periodic events, such as eclipses. The Julian date (JD) of Jan. 1, 1980 (at noon) is JD 2,444,240."

Some database packages have built-in functions to return this value. For example, in Visual FoxPro, calling SYS(11) and passing it a date returns the Julian number for that date. If you try this with 1/1/80, as in

```
? SYS(11, {1/1/80})
```

you'll get back 2,444,240, as expected. There's no such built-in function in Access, but the DateToJulian function shown in Figure 2 does the same thing.

DateToJulian works by determining the number of days elapsed since Scaliger's zero day. Because Access doesn't support dates that go all the way back to Scaliger's zero day, you cannot simply subtract that date from the one passed to the function. Instead, you must take note of the Julian date for the first date that Access considers valid, then add that constant to the number of days elapsed between the date passed to the function and Access's zero day.

Because Access's range of valid dates starts at Jan. 1, 0100, the function first determines the number of days that have elapsed since then and adds the Julian date for Jan. 1, 0100, which is 1,757,585. The result is the Julian date number for the date passed to the function. The JulianToDate function in Figure 2 reverses this process to convert a Julian date number into a calendar date.

Some applications calculate the number of days since the first of the year and call that a Julian date, although I think it's more accurate to call it the *numeric* day of the year to avoid confusion with Scaliger's Julian date. You can use the functions in Figure 3 to convert a date to the numeric day of the year or vice versa. The basic idea is to start by getting a date value that represents the first of the year for the year of the date in question. Once you have that, the rest is easy, thanks to Access's ability to perform date arithmetic.

The DateToNumericDayYear function works by subtracting the first of the year from the date passed to the function and then adding 1. First Access's DatePart function is used to determine the year. Then the DateSerial function is used to construct a date for January 1 in that year. After that, it's a simple matter of taking the date passed to the function, subtracting the first of the year, and adding 1.

The NumericDayYearToDate function works similarly. First, the current year is determined using DatePart and the Date function. Then the DateSerial function is called to return a date for the first of the year. After that, you add the number that was passed to the function to the first of the year and subtract 1.

You can download the code mentioned here from PC Magazine Online. Look for the filename JULIAN.AB. The sidebar "Guide to Our Utilities" in this issue's Utilities column contains detailed downloading instructions.
—*Sal Ricciardi*

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MESSAGING: Competing Global Strategies

IBM/Lotus, Microsoft, and Novell are the basic contenders.

In the late 70s, corporate electronic communication consisted of simple electronic mail transfer systems that ensured the linear delivery and despatch of free-text documents from one departmental address to another. Actually, e-mail evolved as a by-product of mainframe architecture and processing capabilities. One-and-a-half decades later, as messaging hit the desktop PC, it grew into a comprehensive communications infrastructure capable of addressing the extremely complex and diversified messaging requirements of corporate entities. The evolution takes into account the rapid strides made by technology in different areas of information technology, including hardware, software, peripherals and communications. For example, transfer of free-text files has become all but obsolete, with emphasis today on transfer of integrated information in the form of multimedia, or at least formatted text files. New messaging functions such as discussion databases, group scheduling, and electronic forms are becoming the de facto standard. Some of the challenging problem areas today's messaging strategies must address include downsizing, which involves integration of host-based messaging (ideal for distributed computing systems) with client/server-based open messaging infrastructures; and migration, or backward and forward software compatibility in areas like network operating systems, transport APIs, and service provider interfaces. The strategy must also integrate smoothly into the existing infrastructure, and be compatible with products in the pipeline. As large enterprises tend to employ products conforming to more than one proprietary standard, messaging strategies must ensure that components conforming to competing proprietary standards not only co-exist, but also supplement each other's functions and operations.

Due, perhaps to the formidable nature of the tasks today's messaging systems must perform in multi-platform environments, only three companies in the world claim to have developed messaging strategies that are truly comprehensive. These are IBM/Lotus, Microsoft, and Novell. Corresponding to the messaging strategies evolved and being perfected by these companies, there are three proprietary messaging protocols, i.e., Microsoft's MAPI (Messaging Application Programming Interface), IBM/Lotus' VIM (Vendor-Independent Messaging) and Novell's MHS (Messaging Handling Service).

These protocols have spurred the development of different architectures for the management, synthesis and transfer of information including WorkGroup (IBM), LCA (Lotus Communications Architecture) (Lotus), Microsoft Exchange (Microsoft) and Novell Collaborative Computing Environment (NCCI) (Novell). Although totally different in terms of components and linking technologies, these frameworks have one thing in common: they rely on a back-end server and a client software package, with the client providing a universal user interface that can accommodate a wide variety of formats and media types.

The IBM strategy is called WorkGroup. It involves integration of messaging functions between the host environment, in which IBM specialises, and the client/server environment, in which it does not specialise. In fact, the main reason behind the takeover of Lotus Corporation by IBM was Lotus Notes, a versatile and powerful client/server messaging system. The takeover will help IBM and Lotus integrate their messaging systems into a formidable strategy.

In WorkGroup, host-based and client/server mail systems are brought together through the medium of an integrating middleware platform known as MQ (Messaging and Queuing) Series, which serves as a multi-protocol backbone for scheduling, workflow automation, and other messaging-based applications. An essential component of WorkGroup is a client/server communications system promising non-proprietary access. The WorkGroup client will support CMC (Common Mail Call), MAPI, VIM, and CSA (Calendaring and Scheduling API). The WorkGroup server will support VIM- and MAPI-compliant products like cc:Mail and Microsoft Mail clients.

Lotus' LCA is based on CommServer (Lotus Notes/cc:Mail Communications Server), which links cc:Mail (a file-sharing mail system) to Lotus Notes (a client/server system) through four basic functionalities—a backbone for routers, inter-enterprise connectivity, integration of cc:Mail with Lotus Notes, and a pool of administrative functions including interactive management of the integrated networks. Lotus has an extensive migration plan that permits clients to convert from file-sharing mail to client/server messaging. As LCA is operating system-independent, conversions can take place without changing platforms.

Microsoft's MS-Exchange, a client/server messaging technology, integrates enterprise-level communications. Its Exchange client supports client/server messaging capabilities across DOS, Windows, Macintosh, and Unix platforms through dial-up. Besides mail, Exchange supports MEFD (Microsoft Electronic Forms Designer) and other packages for building *ad hoc* front ends.

MS Exchange is based on the principle of a back-end server and a front-end client. The client supports transfer of mail, rich text documents, faxes, X.400 files, images, and so on. It also supports remote and local access discussion databases that can be viewed, sorted, and copied to any location supported by the Exchange Server, which incidentally, is based on Windows NT. The Exchange Server provides native support for common protocols such as X.400 and SMTP (Simple Mail Transfer Protocol). It supports fault-tolerant directory synchronization and interoperates with VIM through a VIM/MAPI converter. Those migrating to Exchange have the freedom to upgrade their servers gradually, because Exchange allows mixed server types to co-exist through MAPI. An interesting aspect of Exchange Server is a migration sub-system containing wizards to assist directory updates and other important services. Novell's messaging strategy is closely intertwined with its ambitious plans of linking all NetWare networks into an intelligent global network. It can be outlined only in the context of its Global Network Services (GNS).

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GLOBAL NETWORK SERVICES: Novell's Answer to Messaging

Novell's messaging strategy is based on its leadership position in networking.

Novell's messaging strategy, incorporated in NCCE (Novell Collaborative Computing Environment), is based on OME (Open Messaging Environment), which enables client applications to support industry-standard APIs across platforms and vendors. The main components of NCCI are GroupWise, SoftSolutions, and InForms. Customers can use any vendor's messaging client to front the GroupWise back-end messaging service. NCCI will support client applications in DOS, Windows, Macintosh, and Unix platforms, and cross-compatibility with any server. Thus, customers will be able to use the functionalities offered by GroupWise products such as scheduling, calendaring, address book, workflow, electronic forms, and discussion databases. NCCE supports common service provider interfaces such as Directory Services, Doc Store, FileNet, HP Open Mail, Image Store and MTA (Message Transfer Agent).

NCCE also supports platform integration through SoftSolutions, which is a document management software that tracks information across all connected networks in the enterprise. Components include APIs for linking to GroupWise services, and application sets from Lotus, Microsoft, and so on.

Novell is integrating MHS, its proprietary messaging protocol, and GroupWise in three distinct phases. In the first phase, basic gateway connectivity was established between MHS and GroupWise through NetWare Loadable Modules (NLMs). Phase two concentrated on integration of administrative and directory services. GroupWise supports directory synchronization with NetWare 4.1, which handles administrative functionalities.

The third phase, which was executed recently, aims at creating an improved MTA between GroupWise and MHS. The convergence supports collaborative scheduling, task management, and form processing. The changes contemplated by Novell will be backward-compatible, so that committed investments can remain secure.

As Novell's messaging strategy leverages the company's strong position in the networking area, it forms an integral part of its recently developed initiative called Global Network Services (GNS). The conceptual framework of GNS is based on the provision of smart network services. Imagine a billion connections to a single global network! It must be intelligent, it must provide universal access (anytime, anyplace), and it must present a simple, logical view of a complex physical infrastructure. This is because a global network is, by its very definition, extremely heterogeneous in structure.

Novell's concept of smart network services has four primary ingredients or ingredient categories. Topping the list in terms of priority and importance is the NetWare operating system and core NetWare distributed services like NetWare Directory Services (NDS). Next are extended client-server service solutions including management, electronic commerce, object broker, and groupware services. These extended services will provide packaged solutions for managing and leveraging the smart global network infrastructure. Then come the NetWare Connect Services that link LANs from across the world into a single public data network, without sacrificing the security of local LANs. The fourth category is that of Internet connection.

Novell has decided to pump in regular enhancements into NetWare to make it the ideal receptacle for GNS. The enhancements will cover performace optimization, increased reliability, hardware optimization, better scalability and enhanced modularity. NetWare architecture allows NLMs to be loaded or unloaded without interrupting the server. NetWare core services, or distributed network services, without which a major part of GNS cannot be realised, will lend smartness or intelligence to the netwrok, so that it can perform routine operations for administrators and users automatically. These services will spread the functionality of the network across any number of physical machines to optimize scalability.

Core NetWare services include directory services, advanced file services, distributed print services, security services, database services, communication services, backup and storage services, mobile services, telephony services, host connectivity services, and transaction services.

NetWare core services will be supplemented by extended services like the NetWare object services, commerce services, and workgroup and management services.

Novell will provide the appropriate distributed object services infrastructure to support multiple object models, including OLE, CORBA, and OpenDoc. While integrating client-based object technologies across the network, transaction services can greatly enhance the way objects are accessed and used in a distributed fashion. For this reason, Novell is basing the implementation of NetWare object services on its advanced OLTP technology from its Tuxedo product family. In addition, basic object distribution functions will be implemented under standard object models like OLE.

In electronic commerce, Novell has thrashed out three focus areas. It will add services to NetWare that will enable electronic transactions, super distribution, and micro-transactions. It will connect these technologies to the Internet, and it will develop strategic partnerships with industry leaders responsible for other essential commerce components. Obviously, the core NetWare services mentioned earlier will play a basic role in delivering electronic transactions. To extend the electronic commerce facilities over the Internet, Novell is extending the NetWare environment in its into the Internet. The company already offers several solutions that link NetWare networks to the Internet. As for key partnerships, Novell already has ties with AT&T, IBM, Netscape, America Online, Oracle, and Sybase.

Novell's NetWare Connect Services (NCS) will enable NetWare networks to link up with other NetWare networks and the Internet. According to Novell officials, currently, there are over 2.5 million NetWare servers catering to routine requirements of over million users. NCS will also open up possibilities of accessing new resources like public multimedia databases will enable enterprises to become part of larger virtual enterprises.

—Hirendra Chan

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MARKET

Mastek to Strengthen Indirect Channels

Bombay-based Mastek, a leading provider of mission-critical software solutions, and distributor of Ingres RDBMS, is in the process of strengthening its distribution network with a major emphasis on indirect sales channels. According to Ravindra Govil, CEO, Mastek India, "As the market explodes, there is a need for reaching more segments effectively. This is where we feel that the strengths of channel partners and Mastek are complementary. Together, we would provide useful solutions throughout India."

"We launched our channel program in October 1995 and I am happy to say that it has been very well received," said Aubrey Corda, Mastek's business manager, channels. He added, "We now have major OEMs and solution-based resellers as our channel partners for marketing CA-OpenIngres and CA-OpenRoad. Our focus right now is on creating Ingres skills in these organizations. Having signed up TISL, PCS, HCL-HP, and Fujitsu ICIM, we are now in a position to address the requirements of a substantial part of the RDBMS server market through these partners. We are confident of establishing relationships with other major players in the near future."

R.P. Singh, VP, HCL-HP, said, "we are excited about Mastek's focus on enhancing channel relationships. A large number of HCL-HP customers are Ingres users. The new agreement with Mastek allows us greater access to CA-solutions. The current OpenIngres technology seems attractive; the recent enhancements in the area of Internet support makes Webcentric Internet/Intranet applications a distinct possibility. OpenIngres and HP Servers are a field-proven combination." B.N. Agrawal, directory, PCS Industries, said, "PCS Data General's AViiON systems are targeted at providing high levels of reliability and performance for our customers. We believe that our agreement with Mastek will significantly add to our capabilities in mission-critical computing environments. The combination of AViiON and CA-OpenIngres is an excellent option for distributed client/server applications."

Besides the OEMs, Mastek would also be offering the CA-Ingres product range through value-added resellers (VARs) and system integrators (SIs) who have built Ingres-based solutions. Current VARs include Ashok Leyland Information Technology—hire purchase & leasing, ACS Technologies—MRP for small/medium-sized pharmaceutical companies, CMC—ports, libraries, water resource management and banking, and Congruent Software—spinning mills. Mastek supports VARs by providing them with low-cost development kits, training, and financial assistance to promote their products through advertising, and exhibitions.

Flurry of Products from Amkette

The Rs 7 billion Amkette group, national leaders in diskettes and storage media, has unveiled a range of unique IT products.

Commenting on the launch of the new products, Rajiv Bapna, director, Amkette group, said, "As a part of our group's strategy, we are introducing new and innovative products that will change the way people work, in every field of the infotech industry. The seven new products that we have launched will not only increase productivity, but also save costs. Some of the products also ensure ecological savings, since they help in reducing non-recyclable waste."

The first of the products to be launched is the Mouse Cleaning kit. The ergonomically designed handle, which is part of the kit, fits into the mouse pit perfectly and cleans all the dust and moisture, thereby enhancing the life of the mouse.

The company has also launched a Tracker Mouse, with a high tracking speed of 1050 mm/sec. Another product the company has launched is Fax Guard, which puts the fax machine off when it is not in use. The machine switches on when any incoming call comes.

For the SOHO (small-office home-office) market, the Amkette group has introduced a pack of five diskettes in different color shells with unique plastic shutters, which allow the user to organize data systematically.

Amkette has tied up with Zoltrix, USA, and is introducing a range of Zoltrix modems in India with speeds of 14,400 bps and 9,600 bps.

Amkette has also launched two products for the printer market. The first is an inkjet cartridge refill system for the entire range of HP and Canon inkjet printers. The refill system has microfine ink that prevents blocking of the nozzle, and contains special dyes and pigments, which ensure lasting print quality. The second product is printer ribbons for the dot-matrix printer. These ribbons use non-corrosive inks that prevent damage to printer head and other assembly.

The Amkette group has also been appointed as the exclusive distributor of



Serif, USA, in the country. The group is launching Serif Page Plus 3.0, a desktop publishing suite. This software suite is also available on CD-ROM and consists of Serif Draw Plus, Serif Table Plus, Serif Photo Plus, Serif Art Plus, and Serif Font Pack.

AMDL Bags Order for AST Pentiums

The IT division of Bangalore-based AMDL (Advanced Micronic Devices) has bagged a major order worth Rs 8 million from Madras-based Future Software. The order is for the supply of AST Bravo Pentium models and related hardware. Future Software, which has been undertaking major development work in cutting-edge technology areas, will be utilizing the AST machines to support and enable its development efforts.

The IT unit of AMDL has a hardware and a software division. It offers comprehensive IT solutions through tie-ups with world leaders like AST, Silicon Graphics, and Bachman Information Systems. It has a facility and an R&D center in Bangalore. The R&D center is recognized by the Department of Science & Technology.

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TISL, IDS to Jointly Market Hotel Industry Software

Tata Information Systems (TISL) has signed up with Internet Data Systems & Software (IDS) to develop and market a versatile property management system (PMS) running on IBM's AS/400 platform, for the hotel industry. So far, this system has been running on PCs and is already in use by more than 120 customers in India and abroad.

TISL and IDS will jointly market IDS's Fortune-V PMS Software on the AS/400 platform. This is a vast improvement upon the current PC-based Fortune-V, offering the first GUI-based system for hotels. It can be used to manage 100 rooms or a multi-locational chain with thousands of rooms.

The tie-up follows extensive research by IBM for a developer with a proven product for hotels. Fortune-V on AS/400 will cover all hotel operations such as reservation, guest history and recognition, group conventions, front desk, housekeeping, holiday packages, travel bookings, telephones, night audit, accounting, materials management, food and beverages management, and management controls.

Nipun Mehrotra, country marketing manager, TISL, says, "This alliance brings together a network-centric IT giant and a leading provider of hotel management solutions. Fortune-V will be a solution with a high functionality-to-cost ratio. It will be a competitive solution. We are sure it will make a major impression in the hotel industry."

Adds Suresh John, director (marketing), IDS, "Already our operations have taken us to Maldives, Sri Lanka, Dubai, Bangkok, and East Africa. Now that we have joined hands with IBM, we will significantly strengthen our Indian operations and also expand in South East Asia, the Middle East, and Africa. Fortune-V on AS/400 will be a world class product for every modern hotel anywhere in the world."

TISL, a joint venture between Tata Industries and IBM Corporation, USA, markets and supports IBM's products and services in India. TISL will market Fortune-V through its network of business partners.

IDS specializes in systems integration, advanced software development, and software for the hotel industry. In India, IDS has undertaken turnkey software development for leading textile mills, sugar mills, pharmaceutical companies, hotels, and marketing outlets. It has also developed management information systems for multi-departmental and multi-locational corporate bodies.

HP, Netscape to Provide Intranet Solutions

In a strategic move to address the demand for reliable intranet solutions for medium to large enterprises, Hewlett-Packard Company and Netscape Communications Corporation have announced that they will work together to deliver intranet solutions based on Unix (R) and Windows NT. The alliance covers technology sharing and product development, as well as joint marketing, sales, support and training.

HP and Netscape plan to work together on seven major initiatives, including developing Unix and NT system intranet solutions for enterprise-wide collaboration; providing intranet-management solutions using HP OpenView and Netscape servers; reselling Netscape SuiteSpot and FastTrack server software for HP-UX(1) and NT servers; ensuring interoperable corporate massaging and information sharing among HP OpenMail, Netscape Mail Server, and Netscape News Servers; authorizing HP as a worldwide support provider for Netscape products; promoting printing and publishing for the Internet; and providing worldwide sales, joint marketing, and consulting expertise to support these solutions.

"There is more to the Internet than just publishing Web pages," says Richard E. Belluzzo, executive VP and head (computer organization), HP. "What users want today are practical enterprise intranet solutions to improve business productivity. By combining HP's expertise in the enterprise and intranets with Netscape's expertise in the Internet arena, we can deliver the products, business solutions, consulting, and support needed to improve customers' business processes."

"Netscape and HP are sending a strong message today to corporate customers. We intend to work together to deliver cross-platform solutions, products based on open Internet standards, and innovative technology focused on intranets and collaborations," said Jim Barksdale, president and CEO, Netscape. "As owner and operator of the world's largest private intranet using Netscape software, HP knows first-hand the needs of enterprise customers. HP and Netscape are drawing on that expertise to meet enterprise needs jointly."

As part of the strategic alliance, the companies will design an open-framework architecture for enterprise workforce collaboration, and develop an intranet-based solution that incorporates products from both HP and Netscape. The companies will leverage their messaging, systems management, and collaboration technologies to improve workforce productivity. This solution will allow corporate users to access, share, and work together on information, documents, and projects even though the individuals may be located in different offices or in different time zones.

In line with their objective of providing enterprise users with the benefits of the Internet's open standards, HP and Netscape plan to identify open and extended application programming interfaces (APIs) for the architecture and publish them, promoting industry support and integration.

HP and Netscape plan to work together to develop intranet management solutions for both Unix and NT system environments, using both Netscape's line of server products and HP OpenView, the industry-leading network and system management software. As a result of this effort, enterprise customers will be able to manage their multi-platform intranet environments more easily. HP will expand its current offerings to include Netscape's latest server software products, SuiteSpot and Netscape FastTrack, which will be resold for HP-UX and HP NetServer.

HP and Netscape will also develop interoperability between HP OpenMail, a leading standard-based client/server messaging system, and Netscape Mail Server, an open, standards-based messaging system. Netscape Communications Corporation specializes in providing open software for linking people and information over enterprise networks and the Internet. The company offers a full line of client, servers, development tools, and commercial applications. Netscape products are sold in India by Bangalore-based Microland.

Hewlett-Packard company has a fully owned subsidiary in Delhi.

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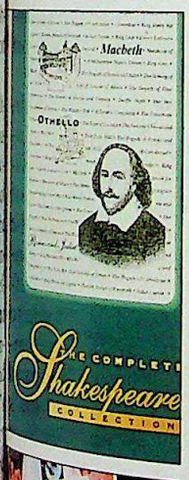
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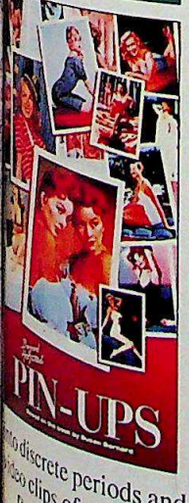
Corel Adds Titles To CD Home Series

Canada-based Corel Corporation has added a number of CD-ROM titles to its Corel CD Home series. These include *The Complete Bible and Reference Guide, Barron's Book Study Notes, The Complete Shakespeare Collection,* and *Bernard of Hollywood's Pin-Ups.*



The Complete Bible and Reference Guide has five sections represented by icons. These are the *King James Bible, Sights and Sounds, Lessons and Inspirations, Barron's Book Notes, and Bible Timeline.* While *the King James Bible* contains every passage of the old and new testaments, *Sights and Sounds* contains video clips of crucial passages like Judas betraying Jesus, and Jesus healing the leper. *Lessons and Inspirations* explores the Bible from the perspective of the scholar and learner. It is full of elucidations and explanations. *Barron's Book Notes* is a complete study guide encouraging readers to investigate major literary, theological, and biblical themes. *Bible Timeline* divides the history of the Bible into discrete periods and offers audio and video clips of major biblical events.





Barron's Book Study Notes is a reference manual and guide for 101 of the world's greatest literary works. It discusses literary aspects like plot, character analysis, setting, themes, form and structure, style and point of view, chapter/act, and profiles. There are sample tests, term paper ideas, reviews, and suggestions for further reading for each literary work. Definitions of literary jargon can be looked up in the *American Heritage Concise* dictionary, which is activated when the user double clicks on a word. There is an adjustable scrolling device that supports automatic scrolling at the reader's desired speed. Users can also insert bookmarks, add annotations, or highlight sentences, passages, or paragraphs in blue, yellow, pink, or green. An automatic link has been provided to the user's word processor.

Corel's Complete Shakespeare Collection offers quick and easy access to William Shakespeare's work with insight into plot development, characters, and themes, as well as a historical background of Elizabethan England. It contains 37 plays, 5 poems, and 154 sonnets created by Shakespeare. *Barron's Study Notes* are included for 14 of Shakespeare's 37 plays.

Corel's latest entertainment title in the CD Home series is *Bernard of Hollywood's Pinups.* It is based on Susan Bernard's popular book *Blondes, Brunettes, and Redheads,* and is a multimedia retrospective of the most glamorous women of the 40s and 50s photographed by legendary Hollywood photographer Bruno Bernard. Users can explore this extensive collection, complete with text and video.

Open Standard for Partitioning Functions

A group of computer electronics companies including National Semiconductor, Opti, PicoPower Technology, SMC, Texas Instruments, and VLSI Technology has announced a new open standard for partitioning functions within PCs. The new common architecture standard simplifies the interconnection of PC components and the PCI bus, allowing PC manufacturers to mix and match any PCI bus and ISA bus-compliant integrated circuits or subsystems peripheral to develop Windows-compatible computers.

Digital Equipment Corporation and IBM have already expressed support for the new standard. Other semiconductor and PC companies are investigating the architecture and are also expected to lend support to the standard. Products implementing the Common Architecture for desktop systems are expected to begin appearing in the market in the second half of 1996.

Major semiconductor and systems companies are promoting Common Architecture standards and intend to form an independent industry association with the mission of recommending design and implementation of open technical standards for PC architectures. Initial efforts center on advancing the desktop PC/AT architecture to accommodate expected improvements in processing, multimedia, and connectivity functionality. A similar effort is underway to define a common architecture for portable systems. David Evoy, senior engineering fellow at VLSI Technology, and Fred Leung, technical marketing manager at National Semiconductor, co-chair both efforts.

Common Architecture replaces current PC architecture with a simplified layered structure between microprocessors, the PCI bus, and legacy ISA bus devices. Under the Common Architecture structure, the microprocessor and system memory occupies the top layer of the structure. A single bridge chip can connect the microprocessor layer to the PCI bus layer. In addition, Common Architecture defines an interface between the PCI bus and ISA devices within the PCI environment.

Common Architecture strengthens the role of the PCI bus in desktop systems by designating the PCI bus as the single connection among system components, and clearly defining PCI interface to the microprocessor and ISA-bus layers. Although a previous generation technology, ISA bus devices have not been completely supplanted by newer PCI bus devices. Continued ISA device backward compatibility remains an engineering issue for the next several years, as the computer industry moves to more advanced PCI bus devices without rendering the installed base of ISA bus systems and components obsolete. Common Architecture will change the way PCs are designed. Instead of inextricably linking PC architectures to a specific combination of microprocessor, core logic, and bus architectures, Common Architecture partitions the motherboard to allow greater interchangeability of storage, connectivity, I/O, graphics, sound, and other sub-systems.

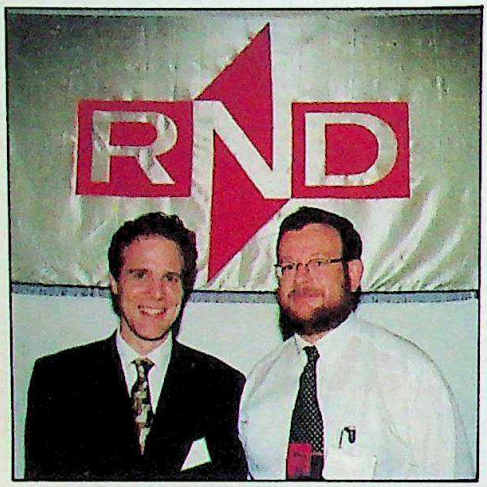
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TIE-UPS

Advantec Launches RND Bridges, Routers

Advantec Network Systems of Bangalore, a distribution company for networking products in India, has formed a strategic alliance with Red Network Devices (RND) for distributing its bridges



Avi Shabtai (left) of RND with Joshua Barton, VP, Advantec.

and routers in India. RND is a part of the RAD group of Israel. "RND products, with variable modules to fit customers' unique requirements and network sizes, addresses the major concerns of investment and investment protection agencies," says Prakash Advani, president, Advantec Network Systems.

The need for routers emerges from the fact that most LANs have developed as hybrids, with one segment being designed on one protocol and a later segment being designed for use with differing, more current protocols. Routers thus not only provide the traffic control tasks of a switch, but also convert signals between protocols such as Token Ring and Ethernet. Routers also perform the critical 'translation' function between LAN and WAN protocols offering adaptability to various public link transmission protocols and speeds.

The unique feature of RND's routers, however, is the emphasis on adaptability and compatibility with customer need, network size, and prior investment. "RND Products like the R-DAPTER offer unique merging features and integration of existing router hardware that enable clients to substantially scale down investment required in setting up networks," says Avi Shabtai, regional marketing manager, RND, adding, "With the distribution strengths of partners like Advantec, we are confident of capturing at least 5% market share in the forthcoming year."

Advantec has strategic alliances with a number of global communication leaders including AT&T, of which it is the largest distributor of structured cabling solutions for the entire South Asian region. Advantec presently enjoys a market share of 60% of the structured cabling systems segment. Advantec Network Systems recorded a turnover of Rs 3 billion for the year ending March 1996. It has nine branches in India and abroad, 4 warehouses and 2 regional depots, and a network of 65 system integrators and resellers.

The company recently announced a tie-up with UB Networks to offer the latter's complete range of products and solutions. It has also formalized a tie-up with American Power Conversion (APC), one of the largest manufacturers of uninterruptable power system (UPS) in the US, to distribute APC's surge suppressors and UPS monitoring software. Advantec will be APC's major distributor for India and the SAARC region.

SCO Licenses Java Technology

US-based Santa Cruz Operations has signed a strategic agreement with JavaSoft, a division of Sun Microsystems, to include Java Technology in its Unix operating systems.

Java technology is an essential Internet development tool that dramatically simplifies the ability to develop, test, and deploy fully Internet-enabled, business-critical applications. It has been hailed as the programming technology of the next decade that does not compromise on performance, security, advanced networking reliability, and enhanced performance.



Alok Mohan, president & CEO, SCO.

Says Doug Michels, chief technical officer, SCO, "We believe that Java is the most important software development technology to appear in this decade. For the first time, developers have an environment where they can create applications that run on all operating systems instantly."

SCO will integrate Java technology with its OpenServer and UnixWare operating systems and development environments. Java development and run time environments will be available to SCO OpenServer developers and OEMs soon. Java will also be included as a standard feature of Gemini, a planned product that combines the features of SCO OpenServer and SCO UnixWare systems.

Developers who use Java to create portable applications will be able to distribute them on SCO client and server systems, knowing that the run time environment will be available on every system without the need to obtain a Java run time license for each application.

SCO is a leading supplier of Unix server operating systems, and a provider of client-integration software that integrates Windows PCs and other clients with Unix system servers from all major vendors.

CMC Is Systems Integrator for Apple

Apple Computer India has appointed CMC Ltd as systems integrator. CMC will develop and promote solutions based on Apple products in the India market. The arrangement will enable Apple products to gain access to key infrastructure development and core sectors.

CMC is a leading systems integrator with multifaceted expertise in information technology. It offers users both in India and abroad range of services and solutions in systems design and development, systems engineering, multi-vendor networking, consultancy, installation, training maintenance, and total facilities management.

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Sonata to Sell IBM Software

Sonata Information Systems (TISL) has tied up with Sonata Software to market and support IBM software products in India. Sonata will now vend the entire IBM software range, including the recently launched IBM Software Servers suite and popular packages like OS/2, DB2, voice, type, dictation, and Internet products.

This tie-up marks the coming together of IBM and Sonata, which is a leading solutions provider and software distributor in India. Through Sonata's widespread network of offices and authorized resellers spread across the country, IBM can now provide software products and solutions with IBM-quality support. Sonata will value-add by providing solutions around IBM platforms for the end-users' customised needs, and back it up with its nationwide services and support infrastructure.

Amitava Ghosh, country manager, software products, TISL, says, "Software products and services constitute a significant portion of IBM's total revenues worldwide. IBM's chairman Lou Gerstner has declared 1996 as the year of Software. IBM will be investing substantially in developing, marketing and supporting software products. As an emerging market, India will be high on IBM's priority list. There is tremendous demand in India for popular IBM software packages like the OS/2 Warp family, DB2, and the recently launched server suite called IBM Software Servers."

P. Srikar Reddy, VP, (India operations), Sonata Software, says, "Sonata views TISL as a key software player in the desktop, server, and data management products market. Considering the high growth that the packaged software business has witnessed over the last few years, and the potential this market offers, Sonata foresees immense potential for growth in TISL's business. With this tie-up, Sonata will leverage its strength to offer a wide range of IBM software products."

TISL is a joint venture between Tata Industries and IBM Corporation, USA. TISL markets and supports the entire range of IBM products and services in India.

Sonata Software is an ISO-9001 certified company. It has the backing of the Rs 5 billion Indian Organic Chemicals Ltd.

IT Dealers' Association Launched

IT dealers have set up a national-level association to protect and promote their interests. The Indian Infotech Dealers Association (IIDA) was created when a large number of dealers gathered for Amkette's Goa carnival. Though IT dealers have regional and local level associations, this is for the first time that the trade has formed an association at the national level.

Announcing the formation of IIDA, Vijay Seth, a prominent dealer from Ahmedabad, says, "Today, the infotech industry is the fastest growing industry in India. The IT dealers who serve more than two million customers throughout the country, are the catalysts to this fast-paced growth, contributing over Rs 400 billion to the total IT trade in India. There was a need to have a national forum which would give the dealers a common platform to present their point of view to the government and industry."

Commencing on the formation of IIDA, Rajiv Bapna, director, Amkette group, said, "We are happy that the dealers' association has been formed at Amkette's Goa carnival. The formation of this association will enable the IT industry and the trade to come together. This will help in curbing the menace of piracy and lead to implementation of fair business practices."

Some of the issues that would be discussed by this newly formed association will be—curbing the menace of the grey market, formulating a self-regulatory mechanism for fair business practices amongst dealers with emphasis on quality and service to the consumers, and lobbying with the government and the industry for extending credit to the dealers.

"The problem of grey market and pirated products has constantly plagued the IT industry. This has not only harmed the reputation of the IT industry in India, but has also caused the country considerable embarrassment internationally. With the adoption of the World Trade Organisation's (WTO's) guidelines which require countries to stop such practices, it has become imperative that we take this issue on a war-footing and work towards ensuring some level of discipline in the trade," comments Seth.

Another major issue that would be discussed by the new trade association will be financial support from banks, financial institutions, and the industry, for the dealers. Added Bharat Shah, one of the pioneers of IT trade in Bombay, "Lack of credit facilities is an impediment to the growth of the IT industry in India. To ease the credit situation, we will have to create an atmosphere of trust amongst the industry and the trade. We have already started working in this direction, and are exploring the possibility of having credit rating done for individual dealers."

The IIDA will also publish a newsletter for its members, which will keep them updated about the developments in the IT industry. "With thousands of dealers in the country, IIDA will spearhead the IT industry's entry into the 21st century and help in extending the reach of the dealer network to the innermost corners of the country," concludes Seth.

IIS Infotech Ties Up with Boston Technology

New Delhi-based IIS Infotech, a software development and services company, has tied up with Boston Technology of the US, a provider of enhanced services to cellular and basic telephone networks. According to the terms of the agreement signed by the two companies, IIS and Boston Technology will work together to implement the latter's range of telecom network solutions in the Indian market. Network-based enhanced services include services like call answering, voice mail and voice messaging, fax messaging, bulletin boards, and reminder services that enable subscribers to extract the maximum from their telephone connections. With these services, phones in the network can double up as pagers and answering machines, or even as an information providing device. Subscribers can receive calls and faxes even when their phones or fax machines are busy or unattended. The calls/faxes get transferred to the subscriber's private mail box for subsequent retrieval.

In India, IIS Infotech will work as a master distributor for the Boston Technology product range. Says Harsh Singh Lohit, GM, IIS Infotech, "With our 400-strong engineer base, we will assist in installation, implementation, customization, warranty, and training to Boston Technology implementations."

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IN BRIEF

HNS Announces Rural Communication Products

Hughes Network Systems (HNS), a leader in satellite-based telephony networks, has announced a new product line—TES Quantum—featuring enhanced digital access and advanced signaling support to dramatically improve telephone services to rural communities, developing countries, and private voice networks. TES Quantum is a platform for intelligent voice and data services, enabling rapid deployment of an advanced telephony infrastructure anywhere in the world.

TES Quantum supports a new generation of high-speed digital applications. Its features include SmartDAMA for full-mesh, demand-assigned satellite connectivity; Toll-ready and DialWare for PSTN Interoperability; Digital Direct for digital trunking; and virtual switching.

For private users, features of particular interest include Secure Skies and Account-Manager. Secure Skies offers both geographic and local redundancy for the network management system. Account-Manager software, available in a variety of formats, provides comprehensive billing statistics, allowing users to allocate costs or bill customers more easily. Supported formats include ASCII, Microsoft Excel, and Bellcore BAF.

IEC Launches New Course

New Delhi-based IEC, a leading software education and training institute of the country, has launched a new course called Master Diploma in Software Technology (MDST). MDST is of one year duration, and is designed to focus on new and emerging technologies like networking, client/server systems, graphical user interfaces, C++, and OOPS. Under MDST, students will receive extensive training in software packages like Oracle, Foxpro, Visual Basic, Visual C++, MS Windows, MS Excel, MS Word, and Power Point. IEC is an authorized Microsoft dealer. It has a network of 136 education and training centers all over the country. The course material has been developed by IEC's R&D Division.

AWARDS/APPOINTMENTS

Digital India

Digital's path-breaking Workgroup Web Forum has won the *PC Week* award for the best software in the Internet-based groupware category. Workgroup Web Forum has been found suitable for group-based conferencing and sharing of information across WANs and LANs. It provides the basic building block for organizations that want to tap the power of the Internet for their own in-house applications.

With the Workgroup Web and Workgroup Web Forum products, Digital combines the World Wide Web paradigm with team collaboration capabilities. The two applications add out of the box team collaboration to graphical web browsers such as Netscape, Microsoft Internet Explorer, and Mosaic. Other features include on-line conferencing, keyword searching, and polling capabilities. Workgroup Web Forum extends the capabilities of an Internet World-wide Web server, using Internet or TCP/IP LAN connections to provide conferencing functionalities not offered by existing web servers. By enabling team members and web site visitors to communicate interactively around the world through private or public connections, it greatly expands business opportunities. It works with all graphics browsers on both private corporate intranets and on the Internet to enhance conferencing capabilities and offer real-time polling. It takes advantage of additional security capabilities like firewalls, gateways and encryption software. Workgroup Web Forum runs on any Alpha or Intel server platform capable of supporting Digital Unix or Windows NT, with the appropriate HTTP server.

Borland International

In an exhaustive product evaluation of client/server development tools conducted by US-based National Software Testing Laboratories (NSTL), Borland International's Delphi Client/Server Suite 2.0 received the highest overall rating out of four leading development packages, performing better than Powersoft's PowerBuilder Enterprise for Windows, Microsoft's Visual Basic Enterprise edition, and Gupta SQL Windows.

NSTL's rating reports are internationally recognized by the international computer industry.

Delphi has also received a number of other awards including the coveted Analysts' Choice award of *PC Week*.

Novell Software India

NetWare 4.1, the industry's fastest growing network operating system (NOS), has again received the "Best NOS" title in *Network Computing Magazine's* 1996 Well-Connected Awards. This award, the 15th bestowed on NetWare 4.1 since its 1994 introduction, further reinforces NetWare's position as the leading network server operating system of choice for organizations of all sizes.

NetWare 4.1 continues to be recognized for its consistently strong feature set. *Network Computing's* editorial staff cited NetWare 4.1's industry-standard Novell Directory Services (NDS), along with the wide variety of available third-party applications, advanced file management, file and directory compression, and remote-administration features as reasons for the product's continued success.

Digital India

P.P.R. Rao has been appointed vice president (multivendor customer services), Digital India. He will be responsible for the entire division's business and operations in India, including maintenance and



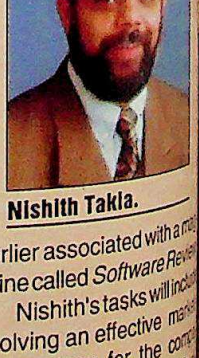
P.P.R. Rao.

support for both Digital and non-Digital systems, networking consultancy and implementation, and outsourcing management services.

Rao is a mechanical engineer with 28 years of experience in the Indian industry. Before joining Digital, he was with the customer service division of Wipro Infotech. He has also worked for prestigious companies like Bharat Heavy Electricals, English Electric, and Nippon Denro.

Spectrum Business Support

Nishith Takia has joined Spectrum Business Support as vice president, marketing. He was



Nishith Takia.

earlier associated with a magazine called *Software Review*.

Nishith's tasks will include evolving an effective marketing strategy for the company's products. Spectrum Business Support is an on-line database access service provider. The company's range of products includes information retrieval software, legal case and research software and knowledge-based CD-ROMs. The company's primary business is information vending.

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Datapro Launches Visio Technical 4

Pune-based Datapro Infoworld has launched Visio Technical Version 4, from Visio Corporation, USA. The new product creates professional technical drawings for space planning, facilities management, construction, heating, ventilation and air conditioning, electric schematics, piping and instrumentation, networking and telecommunications, software engineering, mechanical engineering, manufacturing, and assembly.

The user can produce high-quality technical drawings without the long learning curve and complexity of CAD software. It integrates with Microsoft Office and supports OLE 2.0 applications like spreadsheets and databases.

Datapro Infoworld is the sole authrorized distributor of Visio products in India.

Tulip Lauanches Smallest Computer

Tulip Computers, an European computer conglomerate, recently unveiled what is claimed to be the world's smallest computer—the Tulip id, scheduled to be launched in India simultaneously during the world launch.

Tulip id is a part of Tulip Vision Line's id range. It is being hailed as the all-in-one computer. Packing in its slight frame a powerful Pentium processor, Tulip id is a breakthrough in terms of facilities provided to the end-user. Being touted as slim, silent, stylish, and green, the model has a CPU (footprint) resembling a picture frame, thereby making the id the first and only desktop workstation in the world which, with its 3.8 cm height, will be three times less high than a conventional workstation cabinet.

Tulip id comes with the option of a stylish flat monitor, and is available in the 486 DX configuration. Weighing as little as 3.6 kg, Tulip id packs quite a punch. Its memory disk upgradability is up to 64 MB RAM and it supports up to 2 GB of disk space. It also has two Type III PCMCIA slots and has other high-end features such as Sound Blaster on board, an Ethernet card, and a comprehensive three year warranty. It is also offers an infrared wireless communication facility.

Microsoft Joins Hands with Tandem

Microsoft Corporation and Tandem Computer have announced a strategic alliance to accelerate customer adoption of Windows Net Server in the US $ 8.5 billion server industry.

Tandem will extend its middleware technology, code-named Nonstop ServerWare Solutions, and its ServerNet cluster interconnect technology to the Microsoft Windows NT Server platform. In addition, Tandem will participate in the Designed for Microsoft BackOffice program, which assures customers that Tandem's products have been tested and integrated with the Microsoft BackOffice family of products.

The agreement, which calls for cross-licensing technology patents, provides Microsoft and Tandem customers with "best-of-breed" business-critical solutions, coupled with the cost-effective, scalable, client/server technology of Windows NT Server.

Telecom Solutions from Siemens Nixdorf

Siemens Nixdorf has launched its telecom solutions activities in India. Billing systems and intelligent networks are its two focus areas. Siemens Nixdorf Billing System is a customer care and management system. A flexible billing support system enables a telecom operator to be more service-oriented, and react faster on customer requests.

Global Advanced Intelligent Networks (GAIN) enable network operators to introduce new services for their telephone subscribers like freephone, universal number, premium rate, televoting, virtual card calling, virtual private network, universal personal telecommunications, and so on.

The operations in India encompass products, solutions, and services. In the area of products, the company manufactures and markets the full range of PCs based on the Intel processor family. It has launched a spectrum of midrange Unix-based RISC servers. Besides, the company provides a wide range of telecom solutions. It focuses on four basic lines of business--banking, manufacturing, management systems, and telecommunications.

While we offer you the best, we can do still better, if you send us your comments on the magazine.

Write to

The Editor
PC Magazine India
A39 NDSE II
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IT SHOWS

Exhibition/Fair	Brief description	Date	Venue	Contact
PC SHOW '96 & SW SHOW '96	An exhibition on PC hardware and software.	20-23 June '96	World Trade Center Singapore	Lines Exposition & Management Services 318B King George's Avenue, Singapore 208563 Tel: 2998611; Fax: 2998633
BUSINESS TO BUSINESS '96	Show on office products and services, including computer hardware and software, and communications.	3-6 July '96 18-21 Dec. '96 21-24 Aug. '96 17-20 July '96	Bangalore Bombay Ahmedabad Hyderabad	The Assistant Manager–Coordination Conventions & Fair India 157 Princess Street Bombay 400 002 Tel: 2060808; Fax: 2080171
VLDB '96 (Very Large Database Conference)	An international conference on very large database management. Topics include database engineering, data warehousing, implementation techniques, distributed and client/server databases, hypermedia and object-oriented databases, and so on.	3-6 Sept. '96	Bombay	P. Sadanandan NCST, 6th Floor, Major Tower Visvesvaraya Centre Dr Ambedkar Road Bangalore 560 001 Tel: 91(80) 226 3100 Fax: 91(80) 226 1531
CSI '96	An IT show targeting computer users. IT manufacturers and service providers will display their wares. Business opportunities can be explored.	Oct. 30-3 Nov. '96	Bangalore	M. Dayanand 401, 4th Floor, M.B.C. 134 Infantry Road Bangalore 560 001 Tel: 5511511; Fax: 5562971
COMDEX/FALL '96	A major platform for buyers, sellers, and decision-makers. On display will be the latest in products and services, including computer hardware and software, multimedia, networking solutions, communications, Internet, education and training programs, computer-telephony integration, mobile and wireless computing, and ISDN-related hardware and software.	18-22 Nov. '96	Las Vegas	Business India Exhibitions Wadia Building, 17/19 Dalal St Bombay 400 001 Tel: 2663449/1425 Fax: 2664364/2041974
INFOCOM '96	An exhibition of computer, communication, networking, and telecom products and services for banking, business, and corporate sectors.	19-22 Nov. '96	World Trade Center Bombay	The Organiser Infocom '96 Exhibition 4A Naaz Building, Lamington Bombay 400 004 Tel: 3860436/3851781 Fax: 3874915/6260478
IT ASIA '96	The number one IT industry show of the country with active participation of IT delegations from the US, Europe, and South East Asia.	6-9 Dec. '96	Pragati Maidan New Delhi	MAIT, PHD House, 4th Floor Opp. Asian Village New Delhi 110 016 Tel: 6855487; Fax: 685 1321
COMMUNICATIONS '96	An IT exhibition on communications products and technologies. Good platform for forging commercial and business alliances.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/464[illegible] Fax: 4633506/4648692
BROADCAST CABLE & SATELLITE INDIA '96	A major international exhibition and conference on professional camera, lighting, sound, movie and video production, post-production products, radio and TV broadcasting, and cable and satellite systems.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/464-[illegible] Fax: 4633506/4648692

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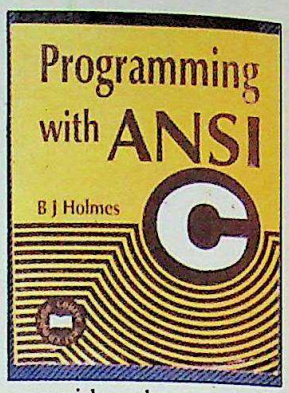
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Programming With ANSI C

By B.J. Holmes

Price: Rs 99; Pages: 519

BPB Publications, B14 Connaught Place, New Delhi 110001



Programming with ANSI C is an excellent reference guide-cum-workbook for those interested in learning the basics of programming. As ANSI C is a subset of C++, the book offers enough reference material for those who want to learn C and then move on to C++.

The book was written with an eye on undergraduate students planning to major in software engineering, information technology, or other related subjects where a basic grounding in programming is an essential prerequisite.

Besides discussing the rudiments of a programming environment and the essential steps in creating an effective software program, the author concentrates on the basic stages in program writing, the purpose of a program and its relationship with data and results, the different levels of computer languages, converting written programs into machine language, and the necessary stages in the implementation of a computer program.

The author also highlights the fact that ANSI C permits programmers to write programs for a wide range of computers.

The book can be divided into three general sections covering 16 chapters and 3 appendices. While chapters 1-8 are intended to provide the reader with a gradual introduction to the fundamentals of programming, chapters 9-12 introduce elementary data structures and program development techniques. Chapters 13 to 16 are devoted to advanced programming techniques and data structures.

Appendix A lists the syntax of ANSI C. Appendix B summarizes ANSI C standard library functions. Appendix C discusses C programming in the Unix environment.

Each chapter has a set of questions at the end to test the understanding of the reader. Example programs are included in a PC-compatible disk that can be ordered at a nominal additional cost.

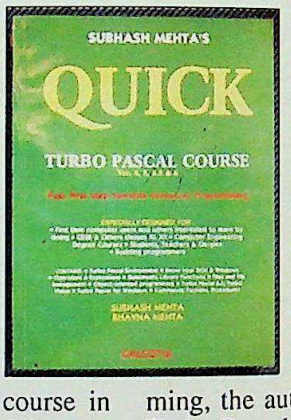
A good reference book for all those interested in picking up the basics of C from scratch.

Quick Turbo Pascal Course

By Subhash Mehta

Price: Rs 110; Pages: 214

Galgotia Publications, 5 Ansari Road, New Delhi 110002



This is a routine Subhash Mehta title on Turbo Pascal, meant for school and college students. The back cover is a revelation. The author claims to have written as many as 75 books on computer-related subjects. Indeed, if quantity is taken to be the ultimate attribute of scholarship, Subhash Mehta is a great scholar. He was a project manufacturing engineer (sic) in the US. I wonder if his job there was to manufacture projects in the same prolific manner as he is churning out books now! The back cover also mentions that the book is meant for students, teachers, and clergies (sic), whatever that might mean. In the hastily written preface, however, the author has second thoughts on the target readership. He assures us that *Quick Turbo Pascal Course* is an instant training guide for stenographers, typists, secretaries, assistants, senior executives, managers, traders, teachers, students, clergies, and children!

Then again, we are glad to know that Bhavna Mehta, the author's daughter, and co-author of the book, is a gold-medalist. Would it not have been more prudent to mention the course in which she was awarded the coveted gold medal? Not that such information should have a bearing on the contents of the book.

After a short introduction to the Turbo Pascal environment, the author moves on to DOS and Windows, and then to Pascal proper. There are chapters on Pascal operators, expressions, library functions, statements, data types, and so on. After a cursory look at object-oriented programming, the author launches into Turbo Pascal as a programming language.

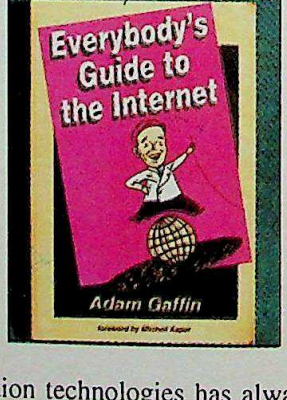
The book is like an untidy scrap book in which pictures and text taken from different sources are pasted together at random.

Everybody's Guide to the Internet

By Adam Gaffin

Price: Rs 120; Pages: 211

Affiliated East-West Press, 104 Nirmal Tower
26 Barakhamba Road, New Delhi 110001



This eminently readable book is a contribution of the Electronic Frontier Foundation (EFF), an organization committed to ensuring general freedom of access to emerging communications technologies. EFF has active and not so active members in all parts of the world. They study the implications of new communications technologies, suggest ways and means of ensuring that the common man has easy access to them, and, if necessary, intervene on his behalf wherever such access is routinely denied.

It would be a good idea to float such an organization in India. It can study the finer aspects of the IT revolution in the country and suggest methods of liberating us from the stranglehold of government bodies like the Videsh Sanchar Nigam (VSNL), that feel threatened whenever there is talk of decentralization and privatization. The extent of freedom available to the common man in India to exploit the powers of emerging communication technologies has always been limited. It was only towards the middle of last year that VSNL woke up to the crying need of offering Internet access to the corporate sector and individuals.

Everybody's Guide to the Internet is an authoritative book on the Internet and is meant basically for the uninitiated. One of its professed aims is to rouse the interest of the reader in the Internet, and urge him to use it as a medium to fulfil his information requirements.

It covers Internet resources in consummate detail. Aspects like e-mail, Usenet, mailing lists and Bitnet, Telnet, the World Wide Web, and business on the Internet are covered very well. The style is quite transparent. The author does not try to intimidate readers with jargon. Nor does he go on and on as some writers have the tendency of doing. Rather, basic Internet concepts are demystified for the general reader.

A must for all individuals who wish to grasp the nature and fascinating reach of the Internet.

—Hirendra Chaudhary

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TVs, PCs WILL MERGE IN THE AGE OF THE INTERNET

Do you see a merging of television and computers? Is it possible that communications speeds could become so rapid that the distinction between cable television and on-line services would erode?

The distinction between communications networks will go away. A single wire coming into your home or office will deliver phone, videophone, Internet, and television service. The connections will be offered by telephone, cable television and possibly even utility companies.

Manufacturers are beginning to experiment with hybrids of televisions and computers, and the underlying technology of the devices will begin to merge. But the form and function of communications appliances such as TVs, computers, and telephones will tend to remain distinct because we use the tools in different ways.

A few years ago, some people speculated that televisions would be the primary devices people would use to interact with information on the "information highway" of the future. The rise of the Internet has made it clear that personal computers will fill this role, instead.

For one thing, television screens can't display small text clearly. And keyboards will remain important even when computers get good at recognizing the spoken and handwritten word.

The PC won't be the only way to browse the Internet though. Televisions will connect to the network through the use of set-top boxes that are, in essence, computers without screens. The wallet PC, which I've predicted in a previous column, will draw information from the interactive network. New-generation telephones will connect, too.

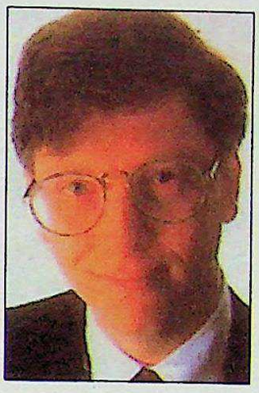
A variety of other devices will evolve as well, although one of the lessons of the PC industry is that not every information appliance someone dreams up will succeed.

One misguided notion several years ago was the businesses would favor so-called "dumb terminals" over PCs. The idea was to deliver data from servers sitting in the center of high-speed corporate networks on diskless terminals that were less-capable than full-fledged personal computers.

The strategy deprived workers of the power and flexibility of using a real PC and flopped. Today these so called X-Window terminals have less than one per cent of the market.

Now some of the same companies that promoted dumb terminals for corporate networks are back proposing a counterpart of the Internet.

It is the so-called "Internet terminal" or "network computer"—an underpowered,



diskless terminal that would draw information only from the Internet and wouldn't allow its users to run mainstream PC applications. Its selling point is that it might cost somewhat less than a fully capable PC.

I'm really unimpressed by this idea.

For one thing, as the technology of the Internet gallops ahead, consumers wanting to take advantage of it are going to want more rather than less power.

For another, people can already buy inexpensive or even used computers that can fulfill the role seen for the terminal.

It is striking that the public has consistently rejected PCs that were relatively inexpensive but underpowered. Stores have just about given up trying to sell $800 personal computers, even though similar machines were hot items when they cost a lot more a few years ago. No one buys them because consumers want forward-looking machines.

This reluctance to settle for a second-rate experience is one reason I'm convinced that terminals won't find much of a market. Even the most price-sensitive consumers will reject terminals in favor of older PCs or TVs connected via set-top boxes.

The issue of what hardware and software will become mainstream in the Internet era is particularly hot right now among the "digerati," because it reflects on the kind of experience the Internet will deliver. I've addressed the topic, at greater length than is possible in this column, in an easy to be posted (in several languages) on the Internet at http://www.microsoft.com/.

Meanwhile, here's a related question.

If TVs and PCs merge, which kind of manufacturer do you think has the advantage, the TV manufacturer or the PC manufacturer?

Traditionally, consumer-electronics companies haven't been deeply involved in the PC industry. Toshiba has been an exception, and other consumer electronics companies have had successes too, especially with monitors and printers. But by and large, consumer-electronics companies haven't been major players.

The landscape is changing. Over the last year, the Japanese domestic market for PCs has exploded. Some non-Japanese hardware companies, such as Apple, have seen their business there drop as homegrown competitors come on strong.

At the same time, Japanese consumer electronics companies have increased their exports of computer hardware. NEC is making PCs. Sony plans to make them and Mitsubishi will sell large-screen TVs that let people browse the Internet. In Europe, Thomson Consumer Electronics is making similar moves.

Consumer-electronics companies have strong skills, marketing, manufacturing, distribution. I expect some to make big contributions to the worldwide PC marketplace, even before the technology of TVs and PCs begins to converge.

The prospect of this increased competition is one reason PC manufacturers are driving to get into more efficient, higher-volume production. Meanwhile, they are readying their own products aimed at the consumer-electronics market.

It could shape as a real battle. If so, the biggest winners will be consumers, who will reap the benefits of rapid innovation and low prices.

Children's books are the crucial educational "technology" today. They're portable, cheap, disposable, and sometimes even lovable. Kids can really connect with books. Can your higher technology do something similar?

Books are great. You can put them in the crib. Kids can take them on a bus or plane. I'm a big fan of all kinds of books, and they will continue to be very important.

Computer software has a growing educational role, and will replace books in some contexts. For example, it's hard to argue against the speed and growing depth of electronic reference works, including online resources.

Younger kids can be quite engaged by good software that lets them make discoveries, or surprises them with audio or video. Kids can treasure software the same way they do books.

Fortunately, books and software can work hand-in-hand. There are companion books for many of the best children's software titles. With the book, you don't have to have a computer on—or even have a computer.

My kids will have computers, of course. But they'll have books first.

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Questions may be sent to Bill Gates by e-mail. The address is askbill (AT) microsoft.com.

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EVERYBODY'S TALKING

YAHOO! KAMAL DARSHAN

By Dewang Mehta

Last month, net surfers around the world were amazed to witness the interesting combination of Internet and minute-by-minute news of Indian general elections.

The world may boast of 30 million Internet users, but in May 1996, 300 million people in India participated in its general elections. It was not surprising that various media groups were quick to put on home pages to provide minute-to-minute information on the Indian elections. The popularity of such home pages was evident, when one of the Indian newspapers' Web site in USA recorded 200,000 hits, all within a month. However, if media groups were quick to put their home pages, political parties were not far behind!

One of the most interesting home page was that of Bharatiya Janata Party (BJP).

KAMAL DARSHAN
http://www.bjp.org/bjp/

Kamal Darshan is the title of the BJP home page. This home page has been quite popular (especially with NRIs) in the last few months. Net surfers have been able to get information on BJP's manifesto and other statistics of BJP's past records in elections. Within a few minutes of Mr Atal Behari Vajpayee being sworn in as the prime minister of India, this home page (with help of newstories from CNN and Reuters) was able to update itself with newstories, including Atal Behari Vajpayee being sworn in by the president of India. It also had details of other council of ministers. Not only that, various links were established with other pages and sites, wherein one could read about news related to election scenarios in India and whether BJP government will survive or whether Deve Gowda or P.V. Narasimha Rao will form the next government. This home page is currently very hot with NRIs in USA. In the current context, it would be worthwhile for a shopping mall to link their home page with *Kamal Darshan* and `piggy-ride'. In any case, one should congratulate BJP for being hi-tech. We have yet to see a Congress home page!

AJIT AND GUJJU JOKES

http://www.rajiv.org/ii/ajit.html
http://www.rajiv.org/ii/gujju.html



"Yahoo is a paradox of trends. As more people get online and visit Yahoo on their maiden voyage, it becomes decidedly uncool for veterans to go there."

In the last few days, another popular India-related site on Internet is the *Desi Web* site and of course, *Humor of India* sites. The *Desi* site amongst others has a collection of Hindi film songs. Whereas, *Humor of India'* lists jokes on Gujjus, Sikhs, and a completely new breed of Deccan jokes. Of course, one cannot miss the Ajit jokes.

A typical Gujju joke would read:
Why did Gujarati Bhai go to Rome?
To listen to POPE music.

Well, if you can laugh at this joke, then you should definitely visit this web site.

Once at this site, one can also visit a library of Ajit Jokes. Some interesting and some not so interesting.

But jokes apart, no serious Net surfer can miss the Yahoo Site!

YAHOO
http://www.yahoo.com

Yawn. Yep, I'm profiling Yahoo. Yeah, I know. You've been there, done that. I understand that it makes you feel good to act all jaded, but don't you dare pretend you're too good to use Yahoo. Everyone uses Yahoo and everyone should. I'm here to tell you why?

You see, Yahoo is a paradox of trends. As more people get online and visit Yahoo on their maiden voyage, it becomes decidedly uncool for veterans to go there. Ironically, Yahoo increases in usefulness every time a newbie links to it? Why? Yahoo is designed to grow and branch out from the collective consciousness. Unlike a traditional library where the establishment decides where books fit in the decimal system, Yahoo is a massive project, reflecting the unusual interests of Web users and demanding its own (often bizarre) categorical structure.

The site was created by two Stanford University electrical engineering graduate students, David Filo and Jerry Yang. They began the library of sites in April 1994 as a glorified hotlist. It soon became popular, and in early 1995, Marc Andreessen of Netscape invited the pair to move the database over to Netscape's servers. As the then-default directory of the world's most popular browser, Yahoo developed a built-in audience that soon catapulted into name-brand status. It wasn't long before the task of indexing sites grew into a full-time job, and the two students decided to make a living from it, officially launching Yahoo, the company. With their recent public offering, they're now rich and famous.

The FAQ notes that the name *Yahoo* is supposed to stand for *Yet Another Hierarchical Officious Oracle*, but Filo and Yang insist they selected the name because they considered themselves yahoos. Karen Edwards, director of brand management at Yahoo, comments, "The future of Yahoo is very dependent upon how cool or interesting the sites are that people create. If there continues to be a large volume of increasingly creative sites, then our surfer team is going to be even busier indexing sites in an intuitive human way. Our challenge will continue to be making sense of the growing mass of content and pointing people into the right places, not just as many places as possible."□

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EDITORIAL

By Kirtimaya Varma

Pipping the PC Past the Post

What impresses me the most about the PC is its Darwinian adaptation to the environment. I cannot think of anything which has so smoothly changed itself to conform to surroundings. When the need for memory was small, PCs had a small memory, but as the need became larger, PC memory grew to fill the need. Business applications as well as operating systems demanded little processing power earlier, but as these became more demanding the PC was not found wanting, and processing power grew in geometrical proportion. With increasing premium on office space, PCs are becoming smaller and smaller. When PCs were required to compute only, they did this job with marvellous efficiency; and when they were required also to communicate, they performed the new task with equal felicity. A high-water mark of computer culture in the early IT era was isolation. PCs in standalone mode were a quintessence of this culture. And when the need arose for PCs to "talk" to one another, and also to bigger computers, they immediately shed their isolation and proved more than equal to the task. Users today expect PCs to have high-performance standalone capability as well as high-performance networking capability, and PCs have lived up to the challenge. And now that consumers want the PC to come closer to consumer electronic devices like the television, the PC has already shown the promise of meeting the customer need. With such an inherited prospective of social, business, and technical demands of the future, the PC will adapt itself to its surroundings.



Anything adapting itself so well to the environment is bound to win in the struggle for survival. Yet, there are rumblings of the PC's death. That companies of the stature of Sun and Oracle, and to an extent even the mighty IBM, should predict the extinction of the current species of PCs is a fact that cannot be sneezed at notwithstanding the PC's extraordinary power of adaptability. I would not like to deliberate upon the business compulsions that might have prodded these companies to come out with a dooms-day prophesy for the PC. Suffice to say that both Sun and Oracle have been unsuccessfully fighting the so-called Wintel dominance tooth and nail—it remains to be seen whether Java can give Sun the lever to change the equation—while IBM has all but lost the operating system war to Microsoft. If the PC were to die, Wintel would die a natural death, thus removing the nightmare that Wintel has become to Microsoft's competitors.

For one thing, we must appreciate the gutsy rebellion of the companies who are making the prediction of the PC's demise at a time when the PC seems not only invincible but also immanent. What would be the shape of the PC's successor, called network computer and costing just $500? Its most interesting feature would be that the user won't have to buy operating system and application software, but download them directly from the network whenever required. This scenario looks far too pleasing to be true. But even if it be true, can the network computer really provide the rich multimedia capability and the level of interactivity that we would be looking forward to in the PC of the future?

Take a specific case. Netscape Navigator 3.0, the latest version of Netscape's world-famous browser software, has 17 Mbit of code. How do you download this onto your 4MB $500 network computer? If you say you'll download only a part, then how do you get the rich flavor that has made this software a global standard? And Netscape Navigator is not among the biggest software we use. Windows 95 is twice the size of Navigator.

Perhaps what Scott McNealy of Sun and Larry Ellison of Oracle are talking about is not a replacement of the conventional PC but a new class of product that can possibly be a simple network connection device if one wants to browse the Net in a simple manner. This device is unlikely to compete with the PC. Nevertheless, one can still not say with certainty that it will not compete with the PC, with Sun already aiming at the corporate market with its JavaStation 1, the world's first networking computer, and IBM, Apple, Oracle, and UK computer companies Acorn and ARM involved heavily in network computers.

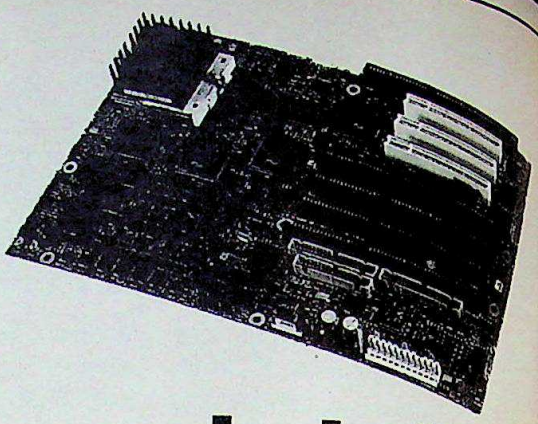
Beyond the hype and hope created by the proponents of network computers, there are many ifs and buts before the network computer can succeed in the market, leave aside pipping the PC past the post. Companies wanting to switch to JavaStation will have to re-write their existing software programs using Java, Sun's futuristic programming language. How many companies will be willing to invest in re-writing their entire programs? Next, with PCs so firmly established in the market, there will not really be a spate of computer programmers who will be want to make network computer software, especially when it is uncertain as to who will buy them and whether the machines can deliver what the likes of Sun and Oracle claim. And even if a good number of software writers do write programs for the network computer, it may take years for the number of these programs to come anywhere near the vast base of programs available today for the PC.

There are indirect evidences that even the proponents of network computers realise that, notwithstanding their predictions, the PC's end is nowhere in sight. As a case in point, Sun and Intel are working together to make Java run well on Intel architecture. If Sun had been convinced of the demise of PC, this alliance would never have come about. Intel has made it known that it is not developing something specifically for the network computer. "The best network access device today is the PC," says Craig Barrett, executive vice president and CEO of Intel, "and its got an Intel microprocessor in it. So why do we need to develop something specifically for Net access?" With Intel thus ruling out support to $500 network computer, Sun-Intel alliance is a tribute to the strength of the PC. □

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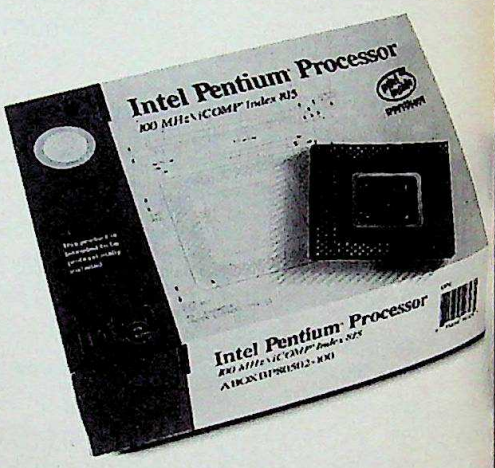
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Trends

TRENDS & TECHNOLOGIES SHAPING THE PERSONAL COMPUTER MARKET



Mainstream NT

A competitor for Windows 95?

Although Microsoft has assured Windows 95's status as a pop-culture phenomenon, sales of the operating system may never reach those of its predecessor, Windows 3.1 (100 million copies worldwide). Microsoft has already sold over 20 million copies of Windows 95, but the company's higher-end operating system, Windows NT, is poised to usurp many of the business desktops that have yet to upgrade from 16-bit computing. Upcoming changes to this 32-bit operating system—together with other industry announcements—could push Windows NT into the mainstream market by the middle of 1997.

With the release of Intel's new Pentium Pro processor—which is optimized for 32-bit code—Windows NT received a significant shot of adrenaline. According to Microsoft CEO Bill Gates, sales have doubled over the past year. Once Intel scales down the Pentium Pro and makes it more affordable, Windows NT will have an even faster path onto the mainstream desktop. "The Pentium Pro definitely gives IS managers greater NT performance," says Adam Taylor, group product manager for Windows NT at Microsoft. "Naturally, as the cost of hardware comes down, NT's system requirements will become more affordable and NT will become more appealing."

Of course, an operating system's appeal rests primarily in its design. Windows NT's current incarnation, Version 3.51, still uses the Windows 3.*x* user interface, offers few native applications, and won't run real-mode device drivers. It does, however, provide robustness and stability: Since operating system services are run in address spaces separate from Win32 applications, and since 16-bit programs are run in a special, protected address space, Windows NT isn't subject to recurring crashes.

With the imminent release of Version 4.0, however, several of Windows NT's shortcomings will become history. The prerelease version is already equipped with the Windows 95 user interface, and it will soon be backed by the new Win32 Driver Model (WDM), which offers compatible drivers across all Windows platforms. These enhancements, plus the fact that most new Windows 95 applications are also Windows NT–certified, should make Version 4.0's final code—scheduled for release around midyear—an attractive option for the desktop.

But don't expect Windows NT to be ubiquitous overnight. Windows 95 will continue to be a force in the PC market during the coming year, especially in the home and portable markets. After all, Windows NT still lacks such user-friendly features as Advanced Power Management, Plug and Play, hot docking, and extensive PC Card support.

Windows NT will also have to contend with IBM's 32-bit challenger, OS/2 Warp. Scheduled for beta testing this spring and release by the end of the year, OS/2 Warp's next incarnation—code-named Merlin—not only adds enhancements to its interface and Web browser, but also includes several compelling voice recognition features. OS/2 Warp has yet to garner widespread support from developers, but IBM claims to have already shipped over six million copies, with major customers in banking, insurance, and manufacturing.—*Cade Metz*

Penny-Pinching Pentium Pros

Naturally, a mainstream operating system requires mainstream hardware. Current versions of the Pentium Pro—the foundation of most of the new Windows NT systems—are much too expensive as mainstream chips, but Intel plans to offer a more affordable, scaled-down incarnation by the beginning of 1997.



Dubbed the Klamath (after the moody river that runs through Oregon and California), this chip will forgo the Pentium Pro's on-board L2 cache in favor of reduced costs. PC manufacturers will need to supply their own external caches, an unfortunate circumstance: If the L2 cache is not on the chip, it must run at the speed of the bus, which, at 66 MHz, is considerably lower than the 200 MHz of current Pentium Pros. But to make up for the drop in performance, Intel plans to increase the primary cache to about 32K.

The Klamath will also support Intel's new MMX extensions, which greatly improve multimedia handling and may boost 16-bit performance by including the Pentium's segment descriptor cache. The chip will be manufactured via a 0.28-micron process and will run at speeds approaching 266 MHz. The subsequent Deschutes chip (planned as a scaled-down version of the Klamath and also named for an Oregon river) will be manufactured via a 0.25-micron process, and will reach speeds of 300 to 333 MHz. —*CM*

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The Big Battle over Tiny Storage Cards

SanDisk and Intel face off for the minicard market.



The market for matchbox-size memory cards is about to heat up. Several computer and consumer electronics devices with built-in support for CompactFlash, SanDisk's smallest form-factor storage cards, have already appeared. But a competing technology, called the Miniature Card, was announced in January, with Intel among its supporters.

Both camps emphasize that "design wins"—inclusion of the cards in shipping products—are the key to victory in the struggle between CompactFlash and the Miniature Card. The stakes are high in this contest, because the Lilliputian storage devices will be used not only in portable computing applications but also in the far broader market of consumer electronics products like digital cameras and audio recorders.

Initially, Miniature Cards will have capacities of 2MB and 4MB; the specification calls for an upper limit of 64MB. CompactFlash cards are currently shipping in capacities of up to 15MB, and a SanDisk spokesperson says that 30MB cards will be available in the first half of 1997, with 100MB cards to appear in 1998.

SanDisk's CompactFlash cards have on-board ATA adapters that allow them to act as disk drives, while the Miniature Cards require flash translation software for that capability. That won't make much difference to consumers, says Connie Batchelder, senior analyst with In-Stat, an Arizona-based market-research firm. "There has always been a division in the flash-card market," she explains. "Some flash-card manufacturers have adopted one or the other, and some have used both. Consumers are not going to understand the distinction. They just want to buy a camera, take it home, and take pictures. Whichever technology gets the most design wins and offers the smoothest compatibilitiy between platforms will come out on top."



CompactFlash has taken the early lead in announced products. Easily the most glamorous design win so far has been IBM's minuscule PC Palm Top 110—available only in Japan—which has a built-in CompactFlash slot. Canon has decided to market CompactFlash as an option for its PowerShot 600 digital camera. A 4MB card will store up to 72 images.

Although no details are available yet on which specific products will use the Miniature Card, digital cameras should appear by the fall, followed by audio recorders early in the fourth quarter. Personal digital assistants that use the Miniature Card should ship in 1997, and wireless communications products such as smart phones and two-way pagers should arrive in 1998.—*Jonathan Matzkin*

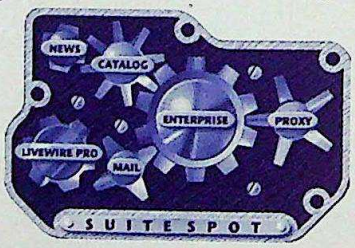
Netscape Boosts Intranet Suite

SuiteSpot to challenge Exchange and Notes.

With the announcement of three additions to its SuiteSpot family, Netscape Communications could make its standards-based server software competitive with Lotus Notes and Microsoft Exchange.

The new server products—scheduled to ship in the third quarter—deliver important security and management features missing from Internet-based tools. Netscape is also integrating the group-discussion functionality of Collabra Share—bought by Netscape last year—into the next versions of its browser and server products.

Netscape Directory Server will provide a global directory service based on the Lightweight Directory Access Protocol (LDAP) for a single point of network management. Netscape Mail Server 2.0 will let you manage messages offline and remotely synchronize mailboxes with the server. Netscape Certificate Server will provide X.509-based digital authentication certificates for secure e-mail and other Internet and intranet transactions.



Following the company's strategy, each of the new servers will be based on open Internet standards. Netscape hopes this will win users and developers away from Lotus Notes and Microsoft Exchange, which rely on vendor-specific application programming interfaces. The products will be available for Windows NT Server and for all of the Unix platforms currently supported by the other SuiteSpot servers. And because its software is based on Internet technology, Netscape says SuiteSpot products will be much more scalable than Notes or Exchange and cost less.

The Directory Server is based on LDAP (Internet RFC1777), a subset of the X.500 ITU directory standard. Like the other SuiteSpot servers, the Directory Server lets administrators manage the server via a frames-enabled browser. LDAP provides a standard way for users, servers, and applications to access and replicate directory information. Other vendors—including AT&T, Banyan Systems, Novell, and Sun Microsystems—are also supporting LDAP.

Netscape says it will add LDAP to all of its servers and to the first release of Netscape Navigator (code-named Dogbert). Netscape also announced that it has hired the University of Michigan researchers who developed and deployed LDAP.

The new Mail Server is based on RFC 1730 and the Internet Mail Access Protocol (IMAP) Version 4.0, which defines remote access features such as partial message download and off-line mail storage.

The Certificate Server uses authentication functionality in SSL (Secure Sockets Layer) and will integrate with the Netscape Directory Server—or, in theory, with any LDAP-based directory server—to manage certificate distribution.—*Todd Spangler*

Top Retail Software

1. **Microsoft Windows 95 Upgrade** Microsoft
2. **First Aid** Cybermedia
3. **Microsoft Plus! for Windows 95** Microsoft
4. **Netscape Navigator** Netscape Communications
5. **Norton Antivirus** Symantec
6. **VirusScan** McAfee
7. **UnInstaller** MicroHelp
8. **Remove-It 95** Vertisoft
9. **CleanSweep 95** Quarterdeck
10. **QEMM** Quarterdeck

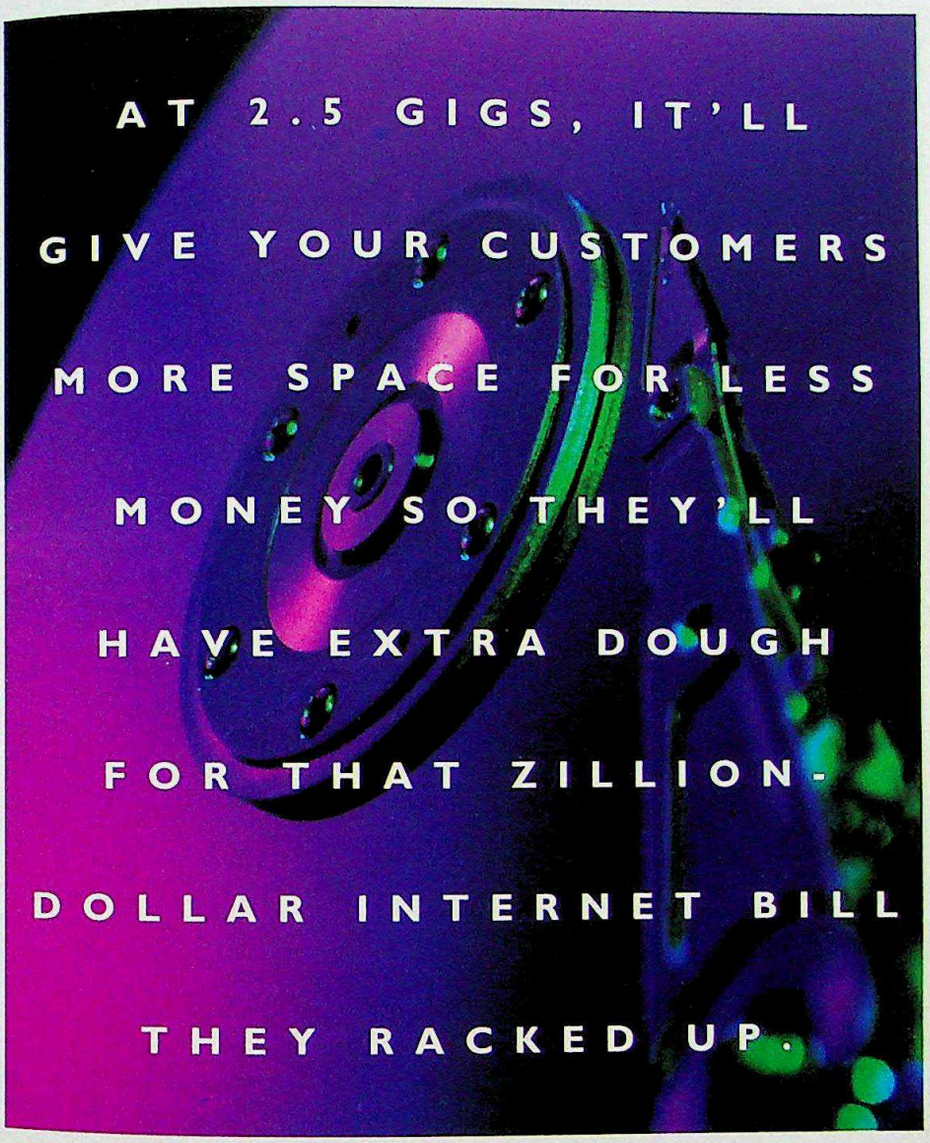
*Source: PC Data. Data for March, 1996

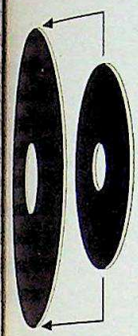
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BIGFOOT

It's big. It's powerful. And it'll give you far more gigabytes for your money. Meet Bigfoot™. Our newest desktop hard disk drive. With specifications like these, it's bound to make a huge impact.





Bigfoot gives you 90% more recording area per disk than a 3½" drive. (2.5GB on a 5¼" footprint to be exact.) Yes, that's the same footprint as a CD-ROM drive. And because it's so large, Bigfoot's high-speed sequential data transfers enhance any multimedia application.

Why are customers afraid to buy new drives? Obsolescence. After all, who wants to buy a drive and run out of space in six months. Fortunately, we've packed 2.5GB into an ultra slim (0.75" high), 5¼" footprint. And Bigfoot is a better value than anything else with the same capacity. Could this mean your customers will have more money for stuff like online time and decaf lattes? You bet.



Unlike that elusive, forest-dwelling  creature, this Bigfoot is easy to find. You can either stop by our Web site at http://www.quantum.com or you can contact one of our distributors. And whatever you do, don't forget to enter a drawing on our Web site to win your very own Bigfoot drive.

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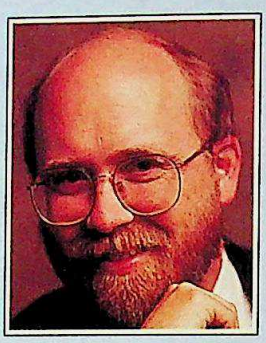
PIPELINE

By Jake Kirchner

A Passion for Personal Computing, Mac-Style

Macintosh users are passionate about their computers. I have experienced that passion firsthand—not because I have been a Mac user, although I have, and not because dozens of my friends and coworkers are Mac users, although they are. I have experienced that passion firsthand through the thousand or so letters I received after I wrote here of my doubts that Apple Computer would ever recover fully from its current financial problems.

In that column, published in our issue of April 9, 1996, I expressed the opinion that when a company experiences severe and mounting losses and decides to concentrate on selling to its installed base—no matter how large or loyal—it's heading for ruin. I said our industry would miss the competition a strong Apple has provided, but I also said I couldn't feel sorry for a corporation that has frittered away so much talent and money on smug advertising campaigns and bungled marketing strategies.



My column on Apple Computer unleashed a flood of emotion—and plenty of fury.

I repeat the gist of that column not to reopen wounds or to risk another flow of outraged letters, but simply to explain the emotion—in some cases, the fury—I unleashed.

Many of the letters thoughtfully discussed the strengths and benefits of Apple's technology. The writers provided fond, touching accounts of their affinity for Macs and of the productivity and personal development their computing experiences have afforded. As one who has a long-standing attachment to personal computing and who makes a living through it, I enjoyed those letters very much.

Many argued that other companies—Mercedes-Benz was a favorite comparison—have lost much more money than Apple yet have continued to prosper. I can't say I found those analogies all that persuasive. And I was surprised that only a few writers suggested that Apple is singularly well positioned to prosper in an age of Internet computing. I used to believe that that was the company's golden future as well, but I haven't seen much success in Apple's efforts to exploit the opportunity.

Unfortunately, those thoughtful and lyrical letters were a minority. By far, most of the letters were single-minded diatribes against "Windoze," which many writers described as a piece-of-junk "Mac-wannabe" foisted on us by that devil incarnate, Bill Gates.

Finally, about 5 percent of my correspondents sent letters so obscene and scatological, I can't even paraphrase them. About those writers, I will say only that these self-styled "evangelists" must be reading from a Bible far different from mine. More importantly, I recognize that they are not typical of Mac users.

As challenged by many writers, I'll revisit this topic when Apple's fate is clear. And if my predictions prove wrong, I'll happily read the thousand "I told you so" letters that will surely follow.

In the meantime, I leave you with a thought about passion: Many writers spoke of devotion to the Mac, this "insanely great machine." I think passion is admirable. What would life be without it? But keep in mind that the Mac is only a machine. In your hands it may be a tool, a pen, a paintbrush, a camera, or a musical instrument—and so it may be in mine. But it's what you do with your Mac that's important, not the machine itself, no matter how elegant its design. We're all better off if you save that passion for your art, your family, your community, the environment, or world peace. Don't waste it on a corporation, and don't waste it on a machine.

Webtop Apps

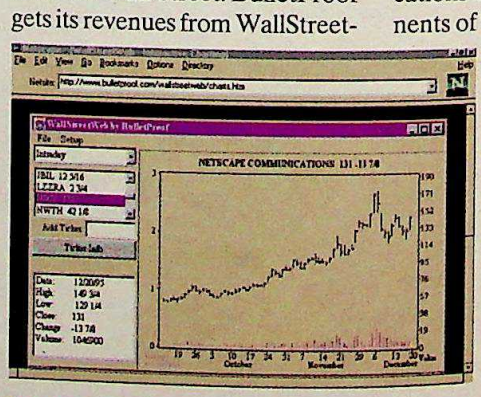
Where does the applet end and the application begin?

As the first sophisticated applications based on Java take shape on the Web, developers are learning some far-reaching lessons. Are we really headed for an onslaught of Web-based Java applications that might present a broad-based threat to standalone applications? Thoughts are divided. Early Java developers, for example, characterize Java as a young development language that works much better for some kinds of applications than for others.

"Java is certainly not ready to do full-blown productivity applications, and there are some kinds of applications that will work better than others," says Scott Milener of BulletProof Corp., maker of the sophisticated Java-based investment application, WallStreetWeb. "It makes sense to do a word processor or a spreadsheet as a standalone application, written in C++ and distributed at retail," he continues. "I like being able to save to my local disk and to print with my word processor, among other things—both of which Java won't facilitate." Milener adds that Java is not yet secure, and that the language needs to be much faster.

Sun's Eric Schmidt agrees. He applauds efforts like Borland's to develop just-in-time compilers for Java, and he adds that Sun's upcoming chips designed to accelerate Java applications will help, too.

BulletProof's WallStreetWeb is designed to compete with standalone market-charting applications like Metastock and Windows on Wall Street. BulletProof gets its revenues from WallStreetWeb by charging $9.95 per month for the delivery of securities data via the Web. Data delivery is the area that makes for what Milener calls "the killer Java app."



DATA DELIVERY: *BulletProof's WallStreetWeb charts current securities data via the Web.*

The race is definitely on to create mainstream productivity applications on the Web, and proponents of the concept of "network computing," like Oracle's Larry Ellison, say it won't be long before standalone productivity applications do face-off with Web-based threats.

Proponents of network computing say the trend toward Web-based applications will not end where word processors and spreadsheets begin. Says Milener, "Applications that kinds are headed for a central work where they can be updated automatically and delivered seamlessly."—*Sebastian R*

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

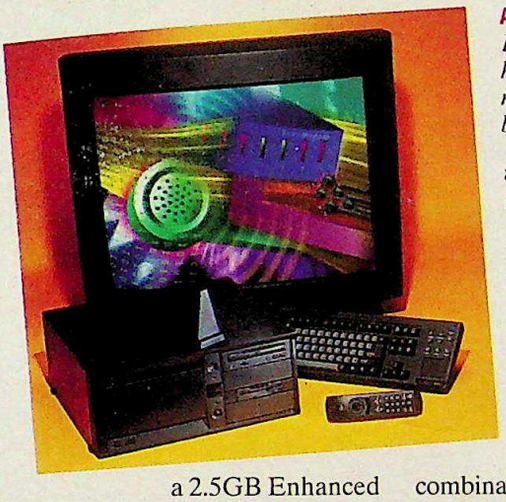
PCs

Gateway Destination: The PC for The Office and the Family Room

By Bruce Brown

In an impressive leap in personal-computer design, component-bundling, and marketing, the Gateway Destination, a big-screen PC/TV, is ready to bring computing, online access, and television to a couch near you. PCs with large monitors and TV tuners are nothing new, but the Destination is the first to put everything together in an attractive package that includes a wide variety of family oriented software. Priced from $5,599 (Pentium/120) to about $6,000 (Pentium/166), the Destination's only shortcoming is the use of a low-resolution monitor that is capable of a maximum resolution of only 800-by-600.

On the surface, the Destination D5-166 test system we looked at was thoroughly conventional. The system lists for $4,349, including a Pentium/166 processor, an Intel motherboard with that company's Triton chip set, 16MB of EDO RAM, and 512K of external cache. Other off-the-shelf components include a 2.5GB Enhanced IDE Western Digital hard disk, an 8X Wearnes CD-ROM drive, a Telepath V.34 data/fax modem, and a 3.5-inch floppy disk drive.



AT HOME: *The Gateway Destination D5-166 is a hybrid of a high-performance PC and a big-screen TV.*

The video card in the Destination sets the technological pace for this PC/TV. Made by STB Systems, the Destination's Video Rage accelerator and 125-channel TV/tuner combination use the Brooktree BtV MediaStream chip set. This PCI card with 2MB of VRAM has inputs for composite and S-Video as well as a cable-television port.

In contrast with analog television sets, the Destination's STB card and Mitsubishi 31-inch monitor combine to form a totally digital system that displays signals as well as and sometimes better than typical big-screen TV sets. On-board digital scaling lets you use the whole screen for television or shrink the image to whatever size you want.

STB also makes the Destination's wavetable/FM-synthesis sound card, which includes Spatializer 3D audio enhancement. No speakers are included in the standard Destination package, because the company assumes that many users will want to connect their stereo systems through the Destination's line-out jack.

We chose to use the Destination's optional $699 Harmon Kardon stereo bundle, which includes a Dolby Pro Logic stereo

Continues on page 18

Corrigendum

In April 30, 1996 issue of PCMI, on page 57, we had incorrectly mentioned that Allen Communications, Salt Lake City, Utah, has no distributor in India. The authorized distributor of Allen Communications in India is TouchStone Systems, C24 Malviya Nagar, New Delhi 110017. Tel: 6441212; Fax: 6476227. The earror is regretted.

Editor

JAVA PROGRAMMING

Symantec Café Pours Java Without the Jitters

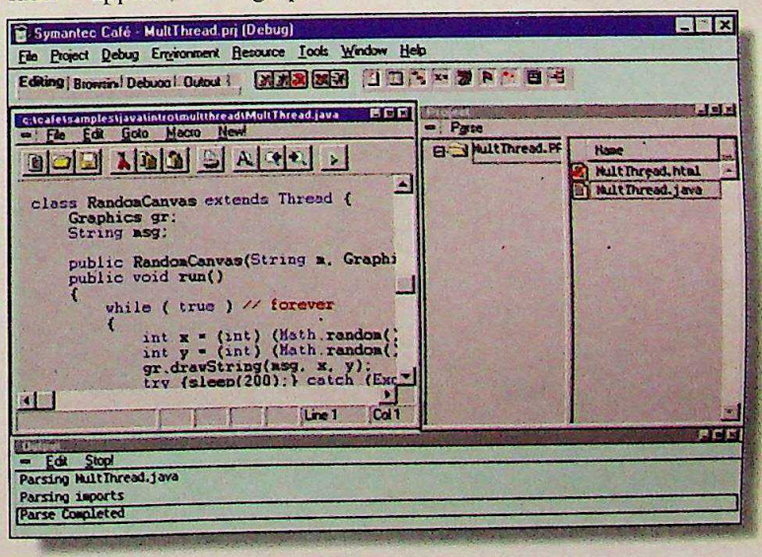
By Jay Munro

Symantec Corp.'s Café 1.0 is the first comprehensive, standalone development environment for Java, a Web-centric programming language, on the Windows 95/Windows NT platform. Based on the company's interactive development and debugging environment (IDDE), the $300 Café does for Java what Symantec C++ did for C programming (First Looks, August 1995). Café provides programmers with everything they need, except the inspiration.

Designed to supplant Sun Microsystems' JDK (Java Development Kit; First Looks, April 9, 1996), Café includes the source code and samples from the release version of Sun JDK. But Café goes a step further with a complete development environment, including wizards for starting projects and generating default applets, a graphical source-level debugger, a native Java compiler, and Café Studio for creating Java views and forms.

With Symantec's IDDE, almost all these features and options are easily accessible through

Continues on page 20



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Gateway Destination

Continued from page 17

receiver; front, center, and rear speakers; and a 50-watt powered subwoofers from JBL. With this option, all we had to do was plug in our VCR and a cable TV connection to create a home-entertainment, -communications, and -computing center.

There are two ways to control the Destination: You can use the wireless keyboard, which includes a touch pad, or you can use the Field Mouse Wireless Remote Control. Operating via a four-channel radio signal, these wireless devices don't have the same range as infrared devices (which means you need to be about 15 feet or less away from the PC), but they're easier to use since you don't have to point them directly at the infrared receiver.

Nobody wants to wait for Windows 95 to boot in order to watch the television or screen a videotape, so the Destination goes into a sleep mode when not in use. Both the keyboard and remote control have power buttons that can instantly wake the Destination up in TV mode.

The system used 38 watts in sleep mode, compared with 104 watts when fully running. This reduced power drain is roughly equal to that of a table radio but is above the Environmental Protection Agency's 30-watt maximum for Energy Star–compliant PCs. Assuming that the Destination were left on in sleep mode 24 hours a day, seven days a week, the power bill would come to approximately $30 per year.

Software is a key component of the Destination's success. The PC comes with a full range of entertainment, productivity, and reference applications. Harmon Interactive's SmartTV lets you change channels and volume, take screen shots, and schedule the TV to videotape shows automatically with an attached VCR.

The most useful piece of software is the SmartTV Programming Guide. For a fee, SmartTV provides downloadable weekly listings for your area. We really liked the ability to search the listings based on a variety of criteria, such as program title and type, actors and actresses, and ratings. There are also brief critiques of all movies listed. A two-week subscription is included, after which the service costs $5.95 per month—slightly more than *TV Guide* costs.

Setup with the Destination was more involved than setup with a typical computer system, particularly since the monitor weighs 120 pounds. Because of this, Gateway recommends that you put the monitor and the system unit in a suitable home-entertainment center rather than on a desk. Gateway provides in-house installation for an additional $1[illegible] ($219 including the sound system)—and Gateway will take the boxes away.

Once the Destination was up and running, we found it easy to switch between computer and TV modes. It was also easy to log on to the Internet to follow Web and Usenet coverage of the same events we were watching on CNN. We found it a little too easy to mix computing and TV viewing, however. We were able to run applications in the background while watching television

NetTV: The Couch Potato's PC

At $2,995, NetTV's WorldVision 2900 is the value alternative to the Gateway 2000 Destination D5-166. The WorldVision 2900 PC/TV includes a Super VGA (800- by 600-pixel resolution) TV/monitor, a Pentium PC with an internal TV tuner, multimedia and communications hardware and software, and an infrared wireless keyboard.

Larger 33-inch and 37-inch combination monitor/TVs are in the works, but NetTV's first model includes a 29-inch screen, which yields a 27.5-inch viewable area. The preproduction monitor we looked at had separate audio and video boards and integrated 6-watt-per-channel speakers on the front. The production monitors will integrate audio and video onto a single board and have speakers on each side. In addition, the vendor says that video quality will be improved.

The WorldVision 2900 includes a 100-MHz Pentium PC with 8MB of RAM, 256K of L2 cache, a 1GB hard disk, a 4X CD-ROM drive, a Rev[illegible] graphics card with 1MB of VRAM, a 125-chan[illegible] TV tuner, 3-D wavetable sound, a Zoom Tele-phonics V.34 data/fax modem, a 105-key infrar[illegible] wireless keyboard with an integrated trackball and a game controller. S[illegible] dard software includes entertainment and refere[illegible] titles and a software packa[illegible] for blocking and monitori[illegible] Internet access called Cy[illegible] Patrol.



HOME SWEET HOME: *The NetTV WorldVision 2900 brings big-screen TV and PC computing to the family room.*

All components but the WorldVision's remote control and game controller have black cases, including the 92-pound, 24.2- by 26.[illegible] by 19.3-inch monitor. The desktop-computer case, called the NetTV Compu[illegible] Deck, at 4.2 by 16.9 by 17 inches is the same height a[illegible] width as—and just 2.5 inches deeper than—a typical VCR. The wireless keyboard works up t[illegible] 40 feet away from the small infrared receiver w[illegible] it's placed in the line of sight.

For performance testing, we added 8MB of

BENCHMARK TESTS

Home PCs

The Gateway Destination D5-166's results on the ZD Winstone 96 and ZD Graphics WinMark 96 tests were slightly below those posted by the comparably equipped Gateway P5-166 system .

The other two home-oriented PCs were both middle-of-the-road performers.

Each system was equipped with 16MB of RAM and ran Windows 95.

Higher scores represent better performance.	ZD Winstone 96 (Score)	ZD Graphics WinMark 96 (Mpixels/sec)	ZD Disk WinMark 96 (Score)	ZD CPUmark$_{16}$ (Score)	ZD CPUmark$_{32}$ (Score)
Gateway Destination D5-166 (P/166)	67	20.9	1,080	323	323
Gateway P5-166 (P/166)*	77	30.3	1,030	326	326
HP Pavilion 7130P (P/133)	47	13.9	712	220	212
NetTV WorldVision 2900 (P/100)	38	10.5	522	167	157

* Reported for comparison.

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M for a total of 16MB. All told, the World-
system was an average performer, with
scores wildly high or low.
vision reception with the World-
is independent of the computer—
with the Destination, which requires
computer to be turned on. The NetTV
iver has two sets of video-input jacks so
plug in a VCR or cable-converter-
ks and run the television with the
e control. As a result, the World-
's software can block certain channels
can display a dozen TV channels at once
couch potatoes.
u can use the full screen for the television
with computer applications running in
kground, or you can shrink the televi-
window and use computer applications or
ine while the television plays in the
w. Coming next is NetTV's Pentium/166
ion, which includes a faster CD-ROM
. For now, NetTV's basic WorldVision
is an easy-to-operate PC/TV at an attrac-
price.—*BB*

TV WorldVision 2900. List price: With Pen-
.00 CPU, 8MB RAM, 256K external
, 1GB hard disk, 4X CD-ROM drive,
ch monitor, $2,995. NetTV Inc., San
el, CA; http://www.net-tv.net.
dian partner.)

keep a small TV screen active
hile we worked, or use the big
creen and the wireless input de-
ices to play games.

The Destination is not only for
milies. The system's big moni-
r can be thought of as an inex-
ensive addition for fixed-site



WHAT'S ON: *Web access and Harmon Interactive's SmartTV Programming Guide let you move among the TV, games, and the Internet.*

presentation systems and for
boardrooms.

In terms of computing perfor-
mance, the Destination was a mid-
die-of-the-road PC. The system's
Winstone 96 score of 67 was 13
percent lower than that of Gateway's Editors' Choice–winning home PC, the P5-166 and its Graphics WinMark 96 score was off the pace by 30 percent. The results of the remainder of our tests were close to those of the P5-166 system.

The Destination isn't appropriate for all types of computing. First, the monitor isn't capable of resolutions higher than 800 by 600 pixels. This limitation will produce disappointing results when you have many windows open or when you show complicated graphics or digital artwork. Second, although text was sharp and easy to read at a distance, it's hard to imagine sitting close to the enormous monitor for any prolonged period while working on a conventional desktop-computer application. Third, if you want to watch television, your spouse wants to explore the Web, and your kids want to use the Destination for homework, it will be hard to share this system.

If Gateway's vision is accurate, within a few years many family rooms, conference rooms, and classrooms will combine computing, telecommunications, and television in one large-screen system. The Destination is a multimedia jack-of-all-trades.

Gateway Destination D5-166. List price: With Pentium/166 CPU, 16MB RAM, 512K external cache, 2.5GB hard disk, 8X CD-ROM drive, 31-inch monitor, $4,349. Gateway 2000, North Sioux City, SD; http://www.gw2k.com. *(Indian partner DCM DS, Vikrant Tower, 4 Rajendra Place, New Delhi 110008. Tel: 5719967; Fax: 5755731.)*

PCs

HP Pavilion Transforms the Home PC into an Image Center

By Alfred Poor

With the addition of a snapshot scanner to Hewlett-Packard Co.'s $3,398 Pavilion 7130P, it's now just as easy to grab images from photos as it is to get them from a floppy disk.

The sculpted mini-tower case looks similar to that of the HP Pavilion 7090 reviewed in our issue of April 23, 1996, but there's also a built-in scanner. Present a photo to this opening and it will be pulled inside while Storm Software's EasyPhoto program is automatically launched. EasyPhoto lets you save your image for use with other Windows applications.

The scanner, which is built by Storm Primax, produces 24-bit color scans at an optical resolution of 400 dots per inch (dpi); with interpolation, you can get a 2,400-dpi scan. The unit can accept originals from 1.2 by 1.6 inches to 5 by 7 inches, but the scanned area is limited to 4.1 by 6.6 inches.

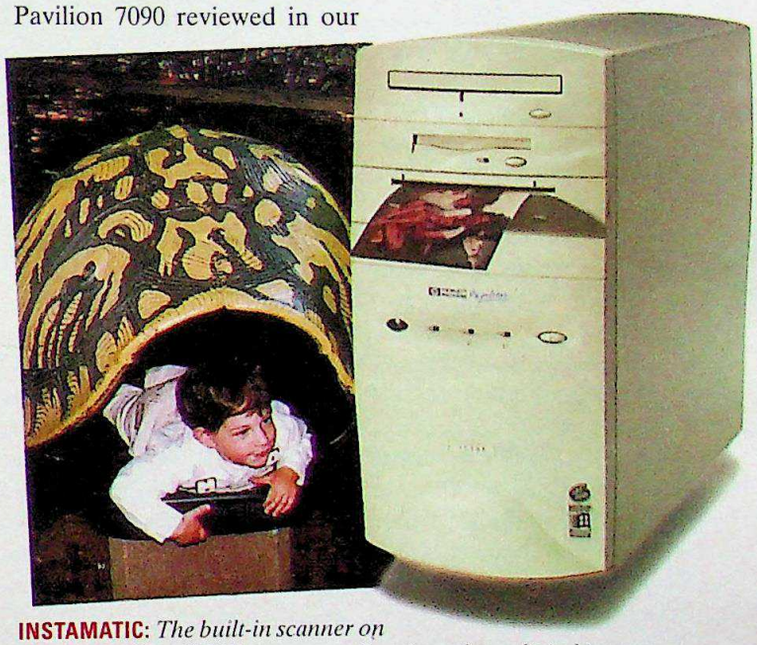
The EasyPhoto software was easy to use and generally worked well, but you may want to use the PC Paintbrush PhotoFinish program, from Softkey. This program uses the scanner's Twain support and makes it easy to crop, enhance, and sharpen photos or perform other edits.

On our tests, the images were generally sharp and clear with no noticeable artifacts. The automatic-exposure settings were good, but using the features in PhotoFinish worked better.

The Pavilion is not the fastest system on the home market; its benchmark test scores place it below average for Pentium/133 systems. But there is more to the Pavilion's mission than raw speed. From the integrated speakerphone and voice mail system to the collection of bundled software to HP's Personal Page interface, this is a complete PC.

The internal color scanner fits in both physically and functionally. The only piece of equipment you'll need in addition to the Pavilion 7130P is a color printer.

HP Pavilion 7130P. Estimated street price: With Pentium/133 CPU, 16MB RAM, 256K external cache, 1.6GB hard disk, 6X CD-ROM drive, 17-inch monitor, $3,398. Hewlett-Packard Co., Santa Clara, CA; http://www.hp.com. *(Indian subsidiary Hewlett-Packard India, New Delhi; Indian partners CMS, Bombay; ECIL, Hyderabad; Godrej Trading, Bombay; HCL-HP, Noida.)*



INSTAMATIC: *The built-in scanner on the HP Pavilion 7130P turns snapshots into sharp digital images.*

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Symantec Café

Continued from page 17

a button on the toolbar. All functions are well supported with tooltips and online help.

Café's ProjectExpress wizard jump-starts projects by allowing the user to specify the project's name, type, included files, and directory. You can use ProjectExpress with or without the AppExpress wizard, which builds the boilerplate start-up code for applets or application files.

If you forgo AppExpress, ProjectExpress allows you to create versions for debugging or release, target type (applet or standalone application), and specify the name of the HTML file or main class file. Café, like its C/C++ predecessor, lets you nest projects, creating subassemblies to include in the program as a whole.

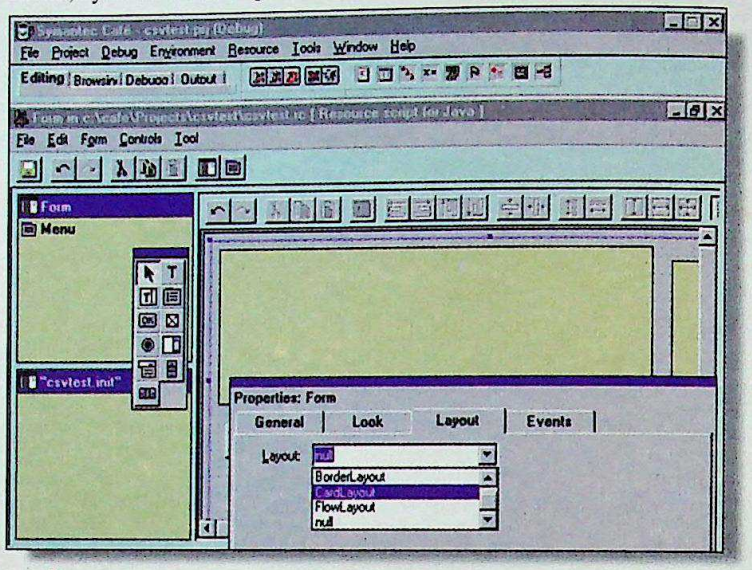
ProjectExpress lets you establish the class and browser, including directories. With the original Sun JDK, programmers found source code wouldn't compile or run unless they set environment variables pointing to their classes. Café automatically handles the class paths with the default setup, but the user can override them in individual projects.

AppExpress can be run at any time, though it works best when used with ProjectExpress. AppExpress creates a .JAVA file that contains an applet class or main class, depending on the project options. A simple form file is also created. At this point, you have a complete working Java application, though it is not much use until you expand on it.

DECISIONS MAKERS READ PC MAGAZINE INDIA

In the tradition of C/C++, the Symantec Editor supports customizable color-coded keywords, bracket matching, and customizable key configurations such as Brief, Emacs, and MSVC. Macro capability is a strong suit in Café. You can assign specific functions to keys, record a series of keystrokes, or write macros in Symantec Basic.

Files can be loaded via the menu, by double-clicking on a selection in the project window, or by dragging and dropping the file into the editor or onto the icon. A cool feature is the automatic indenting of code and brackets while editing Java source code. During testing, we found we saved time by catching bracket-matching bugs as we made them.



CAFÉ STUDIO: *Symantec's Resource Editor simplifies the task of creating forms and views for Java programs.*

For those bugs you don't catch, Café integrates graphical source-level debugging. As with the company's C/C++ debugger, the programmer can set breakpoints and step-into and -over functions and methods and run to a breakpoint. The call chain can be viewed, as can browsing data and objects in the program. For applets, Café uses a viewer that allows the programmer to watch the GUI portion of the program while stepping through code. The debugger requires TCP/IP. You can also use your favorite browser, configurable under the Tools menu, to view finished applets.

The greatest boon to iterative development is the Symantec Java compiler. This compiler is, in a word, *fast*. On a series of informal speed tests on a large sample file, Café's compiler took one-quarter the time that Sun's Javac compiler did (4 seconds compared with 16 seconds). During compilation, any errors are displayed in the output window, with the type and line number of the offending bug. Double-clicking on any given error takes you directly to the line in the source code.

Symantec will release a "just-in-time" (JIT) compiler later this summer. The JIT compiler compiles Java byte codes into native code on the first pass, so the program runs faster on subsequent passes.

For programmers who started with Sun JDK, a real highlight of the program is the Café Studio Resource Editor. From the project-listing window, clicking on the .RC file brings up a dialog box that asks if you want to use Café Studio or receive a text listing of the resource file.

Symantec claims it has used the standard .RC format so that users can import existing C/C++ resource files—but there is a catch. Café Studio creates a file called RESOURCE.K, which contains control ID numbers and other information that if missing will cause an error and cancel the process of loading into the editor. The RESOURCE.K file also causes problems if you create more than one project in a single directory. This only affects loading into Café Studio, not previously loaded Java code. Symantec says it is looking into the problem.

To edit the main form in an applet or application, click on ... Form listing and then on ... .INIT method listing. The ... form comes up in view mode ... the studio window. Dou... clicking on the form puts it ... edit mode, with a toolbox of ... trols ready to go. To add form ... ements, simply grab a ... from the toolbox and drop ... the form. The toolbox ... standard Java GUI ... check box, an Edit button, ... list, Panel, a radio button, ... scroll bars. If you want to place ... icon or picture on the form, ... ever, you're on your own.

A tabbed dialog box ... the properties and events ... able for the controls, though ... woefully incomplete. Many ... erties are missing, such as the ... and color of some controls; ... missing are some events, such ... the paint method. For the ... ods that are there, editing ... easy: Click on an event and ... Edit and the class editor ... up to let you add Java ... When saved, the method ... code are put into your JAVA ...

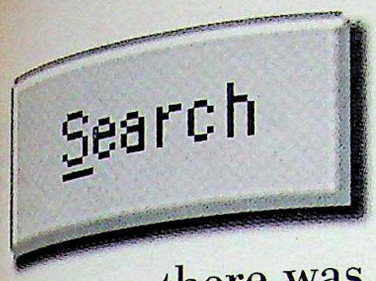
Using Café Studio to ... forms for applets is ... though if you change the size of ... form, you'll need to modify the ... companying HTML file by ... since it stays at the original size. ... comparison with Sun's Java ... shop or Rogue Wave's JFactory. ... Café's handling of events and ... limited controls in Café Studio ... disappointing, as is the glitch ... the RESOURCE.K file.

Despite these rough ... Symantec Café 1.0 is great for ... veloping Java applications and ... plets. Symantec won't have ... stage to itself for very long—... land, Microsoft, Rogue Wave, ... and Take Five are all waiting ... wings. But Café stands head ... shoulders above Sun JDK.

Symantec Café 1.0. List price: ... Requires: 8MB RAM (16 ... recommended), 25MB to ... hard disk space, Microsoft ... dows 95 or Windows NT ... Symantec Corp., Cupertino, ... http://www.cafe.symantec.com. *(Indian partners Infosys Technologies, Bangalore; Sonata, Bangalore; Svam Software, New Delhi.)*

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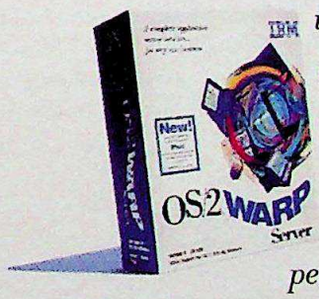
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(You knew there was a better network solution lurking out there somewhere.)

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HTML EDITING

Netscape Navigator Gold Builds Simple Web Pages Without Coding

By John Clyman

Netscape Communications Corp.'s $79 Navigator Gold 2.0 adds basic HTML editing and publishing features to the company's Editors' Choice–winning World Wide Web browser, Navigator 2.01 ("Internet Access: Just Browsing," March 12, 1996). The result is as close to an instant Web-page creation tool as we've seen.

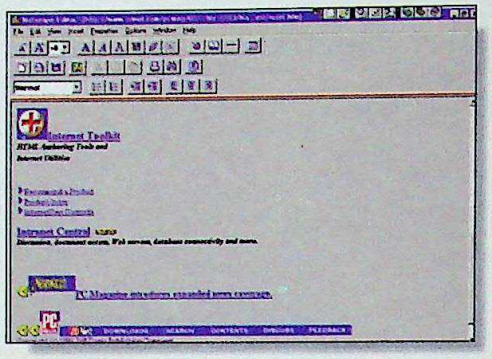
Navigator users will feel at home with Navigator Gold, because the interface is the same. Navigator Gold adds a variety of templates for common page designs so that Web novices will be able to create basic pages painlessly. More sophisticated designs, however, are beyond this program's reach.

Navigator Gold launches in browser mode. Click on a pencil icon in the toolbar and the browser becomes an HTML editor that displays the fonts in near-WYSIWYG fashion. To modify the page's content, you simply position the insertion bar and start typing or cutting and pasting.

Toolbars and drop-down menus provide easy access to tools for inserting images, creating links (including anchor points within the document), and changing text attributes at the touch of a button. Properties boxes let you specify different image attributes, paragraph styles, and text-wrap characteristics.

During our evaluation, we found Navigator Gold made quick work of setting up color schemes (including backgrounds), inserting horizontal lines in varying styles, and performing a variety of basic page-formatting functions. Navigator Gold offers a convenient multilevel undo/redo capability and provides context-sensitive pop-up menus via the right-hand mouse button.

When you're done with your work, save the file, switch back to the browser view, and look over the results. It's no more difficult to use than a word processor, but Navigator Gold doesn't let you exploit many of the HTML extensions that Netscape pioneered: Its support for tables is severely limited, and support for frames is absent. Although you can edit an existing table in unrolled form (which means that columns don't appear in the proper format), you can neither change the table's properties nor create a new table from scratch.



SEEING IS BELIEVING: *Navigator Gold provides a near-WYSIWYG view of the Web page you're editing, with HTML tags in yellow.*

Don't try to edit a page that employs frames, because you'll only end up modifying the "noframes" section that's presented to browsers that can't work with frames. You can always insert HTML tags manually, but it's a somewhat cumbersome process for which Navigator Gold is not well suited.

Oddly, Navigator Gold's browser view sometimes renders line spacing differently than Navigator. Navigator Gold doesn't include a spell-checker, and it provides no mechanism to verify the validity of your HTML code. The Verify button, visible when you're inserting HTML manually, doesn't do anything.

Navigator Gold's ease of use is a double-edged sword: It will attract Web neophytes, but the program's limitations will likely frustrate professional Web designers.

Netscape Navigator Gold 2.0. Price: Rs 3,950. Requires: 5MB RAM, 10MB hard disk space, Microsoft Windows or Windows NT. Netscape Communications Corp., Mountain View, CA; http://www.netscape.com.

(Indian partners Infosys Technologies, Bangalore; Sonata, Bangalore; Svam Software, New Delhi.)

WIRELESS COMPUTING

TranXit Pro: IrDA Easy as ABC

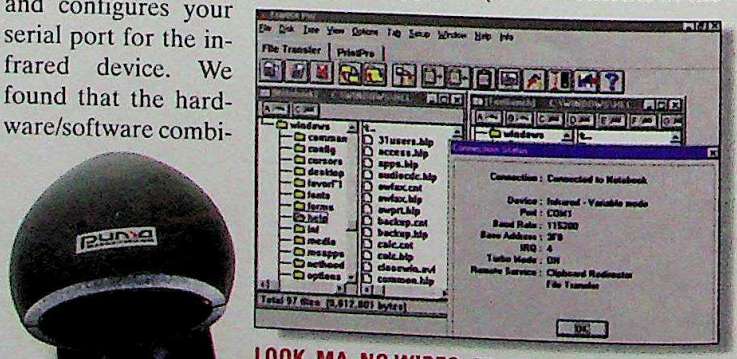
By Alfred Poor

The $129.95 TranXit Pro, from Puma Technology, makes the most of a notebook's built-in IrDA infrared-transmission window for moving files between systems or printing.

TranXit Pro includes a copy of TranXit Pro Connectivity Kit, Version 3.2, and a small, bug-eyed infrared transceiver that plugs into your desktop computer's serial port. Setup takes a few minutes. The installation sequence automatically identifies and configures your serial port for the infrared device. We found that the hardware/software combination worked well in both Windows 3.1 and Windows 95.

Once everything is configured, all you have to do is point the two systems' IrDA windows at each other and start the TranXit Pro software on both computers. The software automatically establishes a link.

TranXit Pro has two main features: File Transfer and PrintPro. The File Transfer screen displays the contents of remote and local disk drives, and you can move or copy files (or the contents of the Clipboard) from one window to the other. Built-in file synchronization lets you update the contents of directories and files. PrintPro lets you print directly from the notebook to the desktop PC's printer with the same ease.



LOOK, MA, NO WIRES: *The TranXit Pro interface helps to configure and monitor the infrared connection between two computers.*

If the IrDA top speed of 115 Kbps is too slow, you can use a null-modem or LapLink-style parallel cable with TranXit Pro's interface. TranXit's Remote Install option lets you send a program to another computer.

Because the file-copy, transfer and synchronization features work on local disk drives as well as across a remote connection, we found that TranXit is also great for file management and archiving.

TranXit Pro provides the flexibility and power needed to use IrDA every day.

TranXit Pro. List price: $129.95. Connectivity Kit only, $99.95. Requires: 4MB RAM; 8MB free hard disk space; serial, parallel, or IrDA-compliant port; Microsoft Windows 3.1 or later or Windows 95. Puma Technology Inc., San Jose, CA; http://www.puma-tech.com.

(No Indain partner.)

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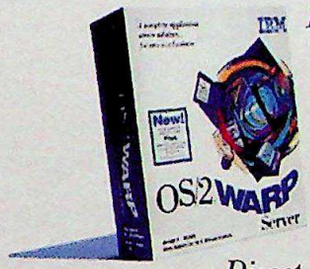
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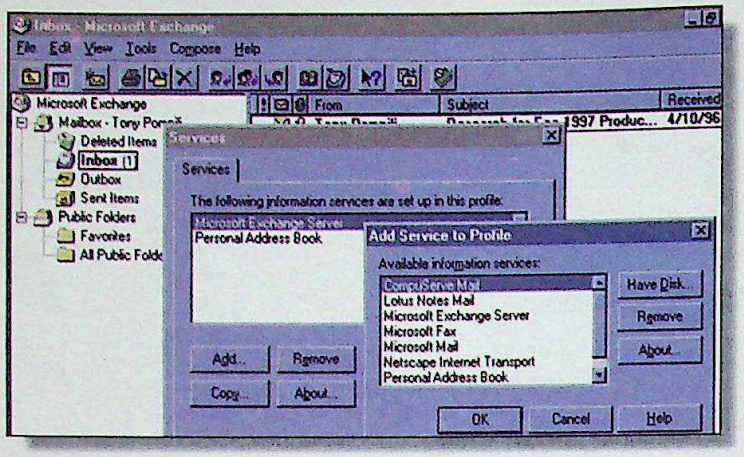
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COMMUNICATIONS

Microsoft Exchange Delivers Client/Server Messaging

By Tony Pompili

Microsoft's long-awaited next-generation messaging system, Microsoft Exchange Server 4.0, is finally here. Exchange is a powerful solution for those looking for the efficiency of client/server architecture and distributed administration. Exchange Client 4.0 extends the program's universal-mailbox features.

Client-access licenses are about $54 each. The Exchange Server Enterprise Edition, which includes a variety of connectors, costs $1,970. A streamlined version of Server is priced at $529.

The Exchange Server is the engine of Microsoft's corporate messaging system. Designed to route messages over LANs or WANs within single- or multiserver organization-wide sites, Exchange has workgrouplike features, such as Public Folders, that let groups of users share information in discussion-like databases and basic tools for customizing message forms and views. Using gateways or Connectors, Exchange can send and receive mail with clients such as Microsoft Mail or any system using Internet SMTP gateways. Exchange Clients are available for all Windows platforms as well as DOS, and a Macintosh client is expected this summer. Exchange Server is limited to *x*86, MIPS, or Alpha-based systems.

Exchange fits snugly into the Microsoft networking scheme by running on Windows NT and piggybacking on many basic Windows NT services. For example, Exchange Administrator or Windows NT Administration applications will guide you through the process of creating both Windows NT and Exchange users. Windows NT Performance Monitor scripts allow you to track server users and server load.

The entire Exchange system uses RPC (remote procedure calls) to communicate between servers and between clients and servers. Exchange works with any of the Windows NT protocols, including IP, IPX, and NetBEUI. We tested Exchange on a system running Windows NT Server 3.51 with Service Pack 4.

Using the Exchange Administrator, you can add users and groups as well as other Exchange servers. The Exchange Administrator extends Windows NT's relatively flat, hierarchical domain structure with a treelike structure similar to Novell's NDS (NetWare Directory Services), making it easier to organize and find resources. This information is stored in Exchange's Directory Services. To ensure that all Exchange servers have up-to-date information, Exchange includes its own directory-synchronization facilities for replicating directories over Microsoft's Site Connector or any of the Connectors, including SMTP or X.400.

LETTER CARRIER: *The Exchange Client works with a variety of back-end mail services, including CompuServe, Lotus Notes, and Microsoft Mail.*

A drawback to Exchange is its inability to extend its native messaging format beyond a single domain. For example, you need a Microsoft Mail, SMTP, and X.400 Connector to send mail between domains, thereby reformatting messages to a more basic, nonrich-text form.

The new Exchange server is also tightly integrated with other BackOffice applications and the Internet. Using the Internet Connector and Internet Information Server (IIS), you can easily make views and messages in your Exchange databases available through Web browsers.

Exchange 4.0 includes a new Exchange Client. Windows 95 users will have to upgrade to the new client from the version that shipped with the OS. The Exchange Server actually works with any MAPI 1.0–compliant client. For example, you could use Microsoft Mail 3.2 as your client and use MAPI mail files, or MAPI Stores, on an Exchange server.

Exchange Client 4.0 is functionally nearly identical to the Windows 95 Exchange Client. Billed as the universal mailbox, the Exchange Client can view and send messages using a variety of back-end messaging systems, including CompuServe, the Internet, Lotus Notes, Microsoft Mail, and faxes. You use profiles to manage your various SPIs and Public and Private Stores.

Exchange Stores can contain nearly any type of file. Exchange supports OLE 2.0 for in-place editing of embedded objects and drag-and-drop. A file can be dragged into a view and the view will automatically in-herit the file attributes.

You don't have to work direc-ly on a LAN to take advantage of Exchange. Using RAS (Remote Access Service) and Exchange's message-based replication, users can create and read messages off-line, save them in a local Store, and later dial in to exchange mail with the server. For Windows 3.1 users, Microsoft includes Shiva Remote software for creating RAS connections.

Like products such as Lotus cc:Mail, Exchange allows you to set up rules for handling mes-sages automatically. For example, you can tell Exchange to reply automatically to messages when you are on vacation or place se-lected messages into a priority folder.

The included Exchange Forms Designer lets you create and cus-tomize basic forms, such as mail or expense sheets. Designer forms are actually runtime Visual Basic applications. Microsoft expects third-party developers to use tools such as C, Visual Basic, or other lower-level applications to cus-tomize Exchange. One such appli-cation, provided by Microsoft, is an Exchange version of Schedule+ that lets users view meeting and other shared scheduled up-dates in their mail databases.

Although most companies dread the idea of changing mes-saging systems, Exchange de-serves some serious considera-tion. Its centralized hierarchical directory-service and administra-tion features are great advantages for managing large networks, and MAPI 1.0 gives sites the flexibili-ty to use a variety of clients.

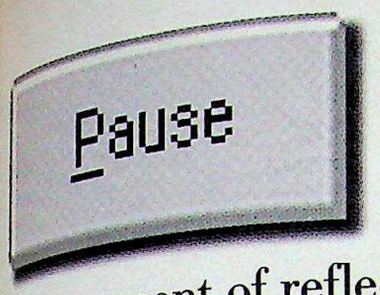
Microsoft Exchange Server 4.0
Price: 5 users, Rs 36,000; 50 users, Rs 190,000. Requires: 32M RAM, 250MB hard disk space, Microsoft Windows NT Server 3.51 with Service Pack 4. Mi-crosoft Corp., Redmond, WA; http://www.microsoft.com.

(Indian subsidiary Microsoft India, New Delhi; Indian partners: Datapro Infoworld, Pune; Godrej Trading, Bombay; Sonata, Bangalore; TUL, Bombay.)

Product Reviews in *PC Magazine India* enable decision-makers in the corporate sector to select the products that meet their specific requirements.

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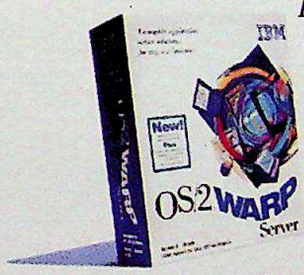
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VIDEOCONFERENCING

CorelVideo Delivers Desktop Conferencing That Doesn't Tie Up the Network

By Steve Rigney

With the exception of a new virus, nothing scares a network administrator more than the idea of running desktop videoconferencing over the existing local area network (LAN). Corel Corp.'s CorelVideo changes all that. At $499 per user for a 16-client license, CorelVideo delivers a lot for a little. The system offers powerful features, including data sharing, personal video phone books, video broadcasts, call forwarding, and tight security.

CorelVideo piggybacks on your existing network infrastructure to move audio, video, and data among clients without interfering with your present data network. Most LANs use Ethernet running over Category 5 unshielded twisted-pair (UTP) cable. The data network uses two of the four pairs of wire in Category 5 UTP. CorelVideo employs a combination of one unused pair of wires and a centralized video switch, keeping all of the audio and video packets off your data network.

PRICE VS. COST

The $499 price tag is just the start, because CorelVideo includes the client software and the required video card but nothing more. To make it work, CorelVideo also requires a video overlay card and a high-quality video camera for each client PC. For our evaluation, we used Corel's $499 CorelCAM; expect to pay as much as $1,200 per seat for everything you'll need.

CorelVideo currently works only with Windows 95, but a Windows NT version should be available by the time you read this. Corel is also promising a Windows for Workgroups version.

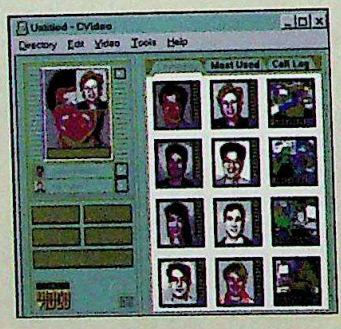
The three pieces of the CorelVideo hardware puzzle are clients, servers, and hubs. The client PC uses a box called the CorelConsole to communicate with a video card in each desktop PC. In addition, the video line card communicates between the hub and your network cable though a punch-down block.

The key is that the CorelVideo system relies on clients sending and receiving the video signal as analog—not digital—data.

SEE ME, HEAR ME



COMMAND CENTER: *The CorelConsole, the heart of CorelVideo's hardware, has many connection possibilities (above). The $499 video camera, CorelCAM, worked well with the system (directly below). CorelVideo's Phone Book makes videoconferencing as*





The good news is that you can run the server software on the PC, which can act as a hub. The bad news is that CorelVideo's hardware installation is complicated and should be left to the network administrator.

The video line card in the hub can handle as many as 16 clients, and you can daisy-chain up to six of these cards in a single server to connect up to 96 CorelVideo users. For more than 96 users, you'll need to use a trunk adapter to link multiple hubs together. If you need remote access, you can install a Corel ISDN card that includes a video codec.

We were impressed with CorelVideo's Phone Book, which not only allows you to see a picture of the person you want to call but also includes other information, such as the person's e-mail address. You can start a videoconference with anyone by clicking on the appropriate Phone Book image.

CorelVideo extends videoconferencing by applying many of the features we take for granted in modern telephones, such as the ability to put callers on hold, transfer a call, or even use a speed-dial feature for frequently called numbers. A unique ability is CorelVideo's broadcast feature, which is a great way to distribute a speech, live demonstration, or press conference.

FREEZE-FRAME

You can also set up what CorelVideo calls a Freeze-Frame. This is essentially a picture of your empty desk—dependent whether you're there or not—is transmitted every few m

With coworkers and supe sors able to peek in electron to see if you're there, CorelV raises personal-privacy i Corel built in several sec screens to ensure your abil remain anonymous. You ch0ose not to show your pi in the Phone Book, turn o Freeze-Frame feature, or decide which users can view at your desk. Our favorite w optional "Do Not Disturb"

All of the CorelVideo op can be controlled by the se administration utility. There logs to track usage. CorelVi also lets you monitor the se and hub.

Throughout testing, the ages and sound that CorelVi produced were sufficient videoconferencing. We were sistently able to transmit an ceive a video stream of abo frames per second, which CorelVideo into the mainstr of network-based videoco encing products.

We found that the qual the sound and images depend much on your monitor speakers as on CorelVideo i For example, images on a 1 256-color monitor tend to blotchy and unnatural, an cheap pair of unamplified sp ers can sound similar in qua an AM-radio broadcast.

CorelVideo's awkward s and current lack of support Windows 3.1 and the Macin are key shortcomings that have to be overcome. But system makes videoconferen as easy as using a telephone provides an inexpensive w take advantage of underut network infrastructure.

CorelVideo. Price: Rs 26,750 quires: Server and hub: 16MB R 10MB hard disk space, Mac Windows 95. Clients: 16MB R 10MB hard disk space, Windo Corel Corp., Ottawa, Ontario, C da; http://www.corel.com. *(Indian partners Datapro Infoworld, Pune Software, New Delhi; Wipro, Bangalore*

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MULTIMEDIA PC

Minicomp Launches PC That Doubles As Color TV

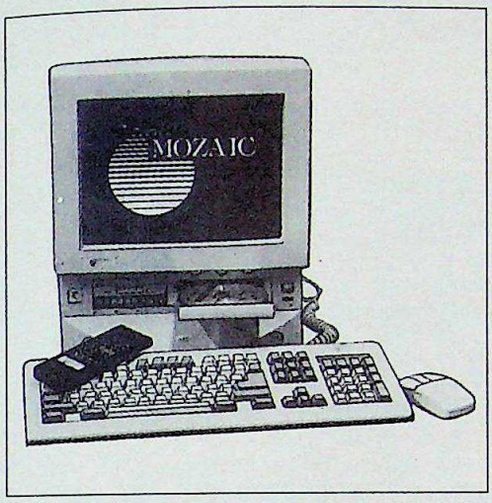
Minicomp has launched a multimedia PC called Mozaic, to cater to the growing market for Internet-ready multimedia PCs in the country.

Current industry trends indicate a growing penetration of Internet amongst all PC users. Moreover, with the entry of new service providers, the Internet access market is likely to grow faster and become more popular.

Home computer users have also developed a clear preference for multimedia PCs that meet all their entertainment, education, personal productivity, and communication needs.

Minicomp, which had earlier introduced a personal communication station called Multicom, has now introduced Mozaic to further enhance Multicom.

Mozaic is a synthesis of a comprehensive range of information, entertainment, communication, and educational tools. It is based on the powerful Pentium processor and includes an in-built CD-ROM drive, 8



MB of RAM (expandable), a fax modem card, a sound card, an integrated speaker, an integrated microphone, a 1.44MB floppy disk drive, a 630MB hard disk, an SVGA color monitor, and a 101-key keyboard. The latest legal version of DOS, and Windows 3.1 come pre-loaded. There is an Internet browser along with TCP/IP stack to make the system truly Internet-ready.

The sound card that comes with Mozaic gives the user a complete music system for playing audio CDs. The reproduction is of stereo quality. Karaoke, a popular feature that enables the user to record his voice by overwriting that of the singer, is also supported.

Mozaic's fax/modem card is with bundled communications software, and it acts as a personal PCO with voice mail, answering machine, and fax capability. It also allows the creation of up to 99 mailboxes with individual passwords and greetings, which can be edited from any remote telephone.

Internet connectivity is a snap with the in-built modem and bundled Internet browser, and the software needed to utilize resources like news groups, e-mail, shopping on the net, and so on.

The TV tuner option converts Mozaic into a 14" television for personal viewing with a 100 channel tuning capability, S-band compatibility, auto-tuning, and a convenient remote control.

An MPEG option is also available which gives the capability to play video CDs and the latest interactive movie games where the ending is never the same. A remote control is also included for convenient viewing of movie CDs.

A set of well-selected CDs featuring a mix of educational, health, and entertainment for all age groups, is offered free with the system.

Mozaic. *Minicomp, Shah Industrial Estate, 2nd Floor JyotiWire House, Azad Nagar, Andheri West, Bombay 400053. Tel: 6269498; Fax: 6292737.*

RECRUITMENT SYSTEM

Software Package to Streamline Routine Placement Agency Operations

New Delhi-based Strategic Management Consults, a local placement agency, has developed Qplace, a DOS-based recruitment package that simplifies the routine data-maintenance and updating operations of professional placement agencies. Context-sensitive help is available through a function key.

Qplace has a simple interface. The data entry screens have deliberately been kept simple and uncluttered. The developers have succeeded in maintaining a semblance of uniformity across the modules, though it is not clear whether the uniformity serves any meaningful purpose. Simplicity is indeed a virtue, but it should become an end in itself.

Qplace has four main modules. The Master option can be used to create codes for crucial fields groups like functional area, qualifications, industry type, cities, levels, and key result area. A list of all master entries can be evoked on the screen through the Listings sub-option.

Data on candidates is maintained in the Data Bank option, which accepts standardized resumes, and a status corresponding to each resume detailing information on past, present, and future interviews. Resumes can be added, modified, or deleted from the database. As the status of a candidate is linked to the client to whom he/she is sent for interview, this field accepts values only when there is a corresponding client in the Masters module. If the status field is left blank, the system generates a reminder to the corresponding client through the Reports option.

The Reports option can be used to print, view or store away resumes, a candidate's status, correspondence, and the list of candidates.

While scanning resumes for short-listing, search is supported on important fields like functional area, age, total experience, qualifications, salary drawn, and so on. Age and experience are updated by the system automatically. Status reports can be generated on candidates as well as clients.

Under Correspondence, the user can generate routine standardized letters like reminder to client, changes in resume, interview call letter, preliminary letter, regret letter, and so on.

The Candidates List sub-option under Reports generates a complete list of candidates corresponding to a specific functional area.

The software also supports utilities for file indexing, back-up, restoration from floppy to hard disk, encryption of database files, decryption of encrypted database files, and password creation and modification. The Windows version of the package will be released in the coming months.

Qplace. *Strategic Management Consults, 143 Ansal Chamber II, 6 Bhikaji Cama Place, New Delhi 110066. Tel: 6166536; Fax: 6184872.*

CORRIGENDUM

In the editorial titled *Damn Piracy, Curse the Pirate, But Pray for His Soul* in the June 15, 1996 issue of *PCMI*, we had expressed doubts whether all the softwares used by leading training institutes and their franchisees are legal. NIIT affirms that it uses legal software only, as also its franchisees. It has agreed to provide us with evidence in support of the claim. We regret any inconvenience caused to NIIT because of our observation.

In the same editorial, we had mentioned that a few months ago BSA had said that the level of software piracy in India was as high as 85%. NASSCOM says that this figure is not true, and BSA concurs with NASSCOM's figure about the level of piracy, which is 63%. Any inconvenience caused to NASSCOM is regretted.

—The Editor

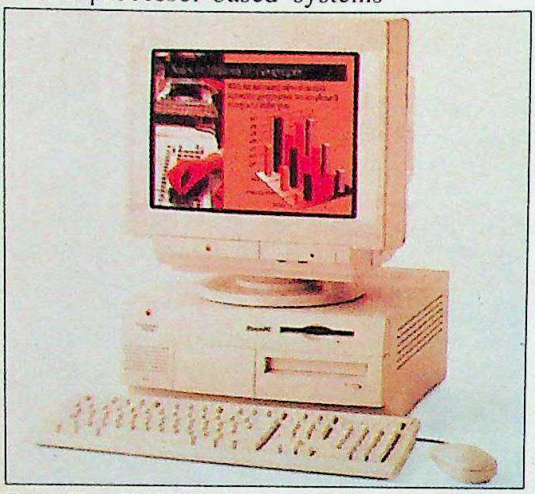
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POWERMAC

Apple Launches PowerPC 604-Based Power Macintosh Systems

US-based Apple Computer has introduced four Power Macintosh models designed to increase processing speed at competitive prices. While 9500/150 and 8500/150 are PowerPC 604 processor-based systems running at 150 MHz, 7600/120 and 7200/120 have the same RISC-based PowerPC 604 processor running at 120 MHz clock speed.



PowerMac 7200/120: *Aimed at education, entertainment, and low-end publishing sectors.*

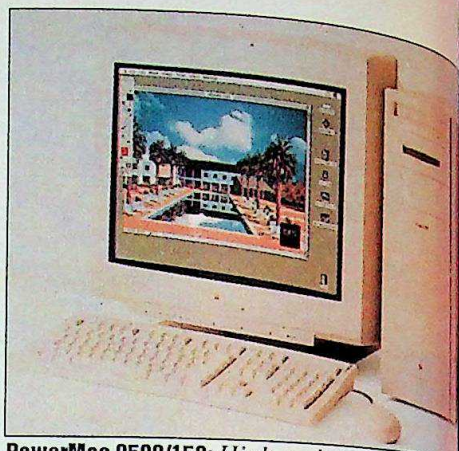
Power Macintosh 9500/150 and 8500/150 are intended for high-end publishing, multimedia applications, and Internet authoring. These systems are higher clock speed versions of the existing 9500/132, 9500/120, and 8500/120.

Power Macintosh 7600/120 and 7200/120 are ideal for education, corporate applications, and low-end publishing. The new CPUs feature multinode support for Apple's forthcoming PC-compatible cards, which enable the Power Macintosh and the PC-compatible card to maintain a unique Ethernet ID on a network simultaneously.

All the new models have Apples's operating system 7.5.3 pre-installed on them. The new version of the operating system enhances overall system stability, and provides more PowerPC-native components, updates network communication through the Open Transport Interface and the Apple Internet connection kit containing a selection of third party applications like Netscape Navigator (Netscape Corporation) and Emailer Life (Claris).

Apple has also introduced two new PCI-based PC compatible cards featuring a Pentium 100 MHz processor. The cards enable DOS and Windows applications to access Apple peripherals like printers and modems. All Apple displays are supported, in addition to many third party SVGA and VGA displays. The processor cards also offer a PC game port and 16-bit SoundBlaster support for DOS and Windows. Users can easily connect to a variety of networks. As mentioned earlier, users can maintain two unique Internet connections simultaneously, one in each environment.

The four models come in a wide range of configurations. The prices range from Rs 167,000 for a low-end system to Rs 460,000 for a high-end one. This compares well with the prices of the Apple range of Mac products.



PowerMac 9500/150: *High-end system for multi... Internet authoring, and quality publishing.*

Apple Computer is repres... ed in India by Apple Comp... India, a wholly-owned sub... iary. Apple products are dis... uted in the country by W... Infotech, Unicorp Industries ... Odin Computers. They are ... sold by Tangerine (retai... CMC (systems integrator), ... International Graphics (m... reseller). A network of over ... resellers sell and support A... products all over the country.

Apple 9500/150, 8500/1... 7600/120, 7200/120. *A... Computer India, 5th Floor ... Parc Trinity, M.G. Road, B... galore 560001. Tel: 5550... 74; Fax: 5550660.*

DEALER MANAGEMENT SYSTEM

Brainwave Launches Software for Automobile Manufacturers/Dealers

Bombay-based Brainwave India has developed a dealer management system for the automobile industry. It can take effective care of distribution, spare parts management, and servicing. Created with FoxPro 2.6 for Windows, the software has five independent modules.

The Sales module can be used to raise quotations, indents and receipts against payment from customers. It also provides information on sales and dealer performance, and maintains waiting lists for items in short supply, or for expediting supply parts against indents. It also registers and follows up on transit damage claims and pre-delivery defects.

The Service module simplifies the procedure of servicing a vehicle during the warranty and post warranty periods. There is a provision for arranging mobile on-site servicing of vehicles. Customer and vehicle history is maintained and analyzed for customer service improvement. Separate accounts are maintained for used resources, and bills are raised accordingly. Warranty claims and settlement can be effectively monitored.

The Spares module helps distributors and dealers to scientifically manage their spares. Indents based on user-defined parameters are generated automatically. These can be monitored. The module also accounts for the spares used during servicing, repairing, and maintenance of vehicles, and also of counter and mobile van sales. It also keeps track of all payments, and gives details on the amounts receivable and payable from the customers and the principal.

The Accounting module keeps track of financial transactions between the manufacturer and his dealers regarding advances, commissions, warranty claims, down payments, and so on. Financial transactions between a dealer and his customers are also maintained under heads like advance paid, final payment against delivery, and servicing.

The MIS module generates information required by the dealer to improve his sales, enha... the customer base, get feedb... on customer satisfaction, and ... on. It also generates reports ... analyzing the organizatio... functioning like load on w... shops, stores, mobile serv... movement of parts within st... and seasonal consumption ... terns. Sales comparisons ... tween current and previous ... are also supported. The pack... will be of immense use to ... mobile dealers.

Dealer Management Syst... *Brainwave India, 112A Sa... Building No 5, Mittal Indus... Estate, Andheri Kurla R... Marol Naka, Andheri E... Bombay 400059. Tel: 8322... Fax: 6105494.*

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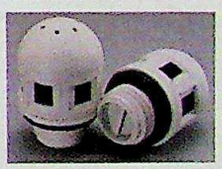
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SOFTWARE DEVELOPMENT KIT

Novell Announces NetWare SDK for Java Applications

US-based Novell has announced the NetWare Software Development Kit for the Java Platform, a software development kit that enables developers to create Java applications and execute them on NetWare, the world's leading network operating system. The announcement follows Novell's licensing of Java technology from Sun Microsystems. The NetWare Software Development Kit for the Java Platform will enable developers to build a new class of network-aware applications that will make NetWare the premium platform for intranet applications. Java logic can now be distributed to the server, leveraging the efficiency and power of existing networks while increasing application performance. Novell also announced that it is working with JavaSoft on proposals to expand the Java class libraries to include such services as naming, directory, and other networking capabilities.

The NetWare Software Development Kit for the Java Platform will include Java Virtual Machine, a series of NetWare-loadable modules (NLMs) that make applications written in Java, executable on NetWare. The development kit will also include the Java class libraries with additional NetWare-specific class libraries to enhance NetWare development.

The announcement supports Novell's Net2000 developer initiative, a collection of technologies designed to enhance and ease the development and deployment of new, network-aware applications and components. Using Net2000 application programming interfaces (APIs), developers can easily create NetWare applications using industry-standard interfaces, and leverage network services to find and share those applications and objects across networks, including intranets and the Internet.

The NetWare Software Development Kit for the Java Platform and other Net2000 technologies will help developers hasten the advent of client/network computing, an advanced computing paradigm that goes beyond desktop and client/server computing to give developers users access to information components across global enterprise networks. Novell's support for Java significantly expands the scope of Java developers' audiences by over 50 million potential users, providing a significant business opportunity to a growing number of companies choosing to develop applications in Java.

NetWare Software Development Kit for the Java Platform. *Novell Onward Software India, Marwah Bhavan, S. Vihar Road, Bombay 400 Tel: 8351995; Fax: 82142*

UTILITY

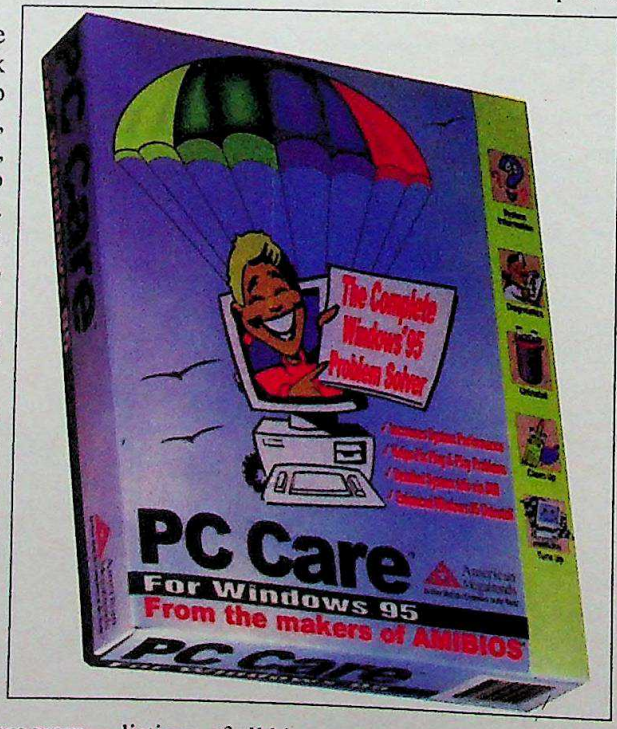
American Megatrends Launches Diagnostic Tool Set for Windows 95

Bhubaneshwar-based Megasoft Systems has announced the availability of PC Care for Windows 95, a software utility from American Megatrends, that claims to offer complete support for the Desktop Management Interface (DMI).

The utility has five modules which work together seamlessly to diagnose PC problems, verify system integrity, and suggest ways to optimize performance. The five modules are: System Information, Application Uninstall, System Diagnostics, System Clean-Up, and System Tune-Up.

PC Care exploits DMI technology supported by BIOS vendors to offer standardized system information that benefits both users and manufacturers. The utility collects information stored in the BIOS and puts it into a standardized management information file format. The program then interprets DMI data into a simple report for reference.

The System Information module is a complete system and setup information program. It provides complete information on EISA, PCI, Plug & Play, PCMCIA, SCSI, power management, multimedia, and network. The user can obtain complete listings of all his setup information, as well as information on memory, storage, and operating system, extracts coded DMI information from the computer's BIOS, translates the data, and offers a detailed system report in simple English. The user can verify whether or not his system is configured as specified, and to compare known system components with what PC Care finds, in order to determine that the hardware is functioning properly.



Application Uninstall can be used to remove unwanted applications or application groups from the user's systems. The module deletes all files, icons, fonts, executables, drivers, program groups, and system file entries associated with the given application. A complete backup option is provided.

The System Clean-Up modules creates space on the hard disk by cleaning up unwanted files. It removes temp files, duplicate files, the system registry, and orphan files (files without parent exe files).

PC Care's Diagnostics based on AMI's popular AMIDIAG software. It can detect operational flaws in the system's hardware and suggest remedial action.

The System Tune-Up module provides suggestions for improving the system's performance. It tunes up important files like CONFIG.SYS, AUTOEXEC.BAT, WIN.INI. It also recommends changes in hardware configuration to boost general system performance.

AMI is planning to provide complete integration with Windows 95 upgrades and other operating systems, to support the next wave of DMI technology.

Atlanta-based AMI is known the world over for AMIBIOS, the BIOS program installed in more than 50% of all PCs. The company is also known for its other BIOS related programs.

Megasoft Systems is the authorized distributor of AMI products in the country.

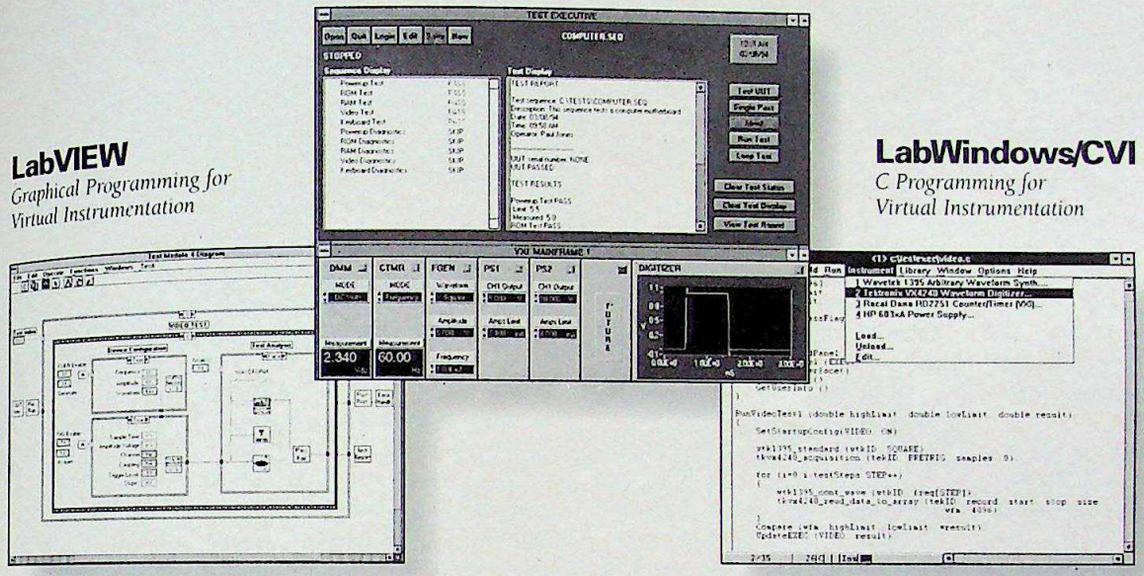
PC Care For Windows *Megasoft Systems, Bomikhal, P.O. Rasulg Bhubaneshwar 751010, O Tel: 481737; Fax: 41384*

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DATA MINING TOOLS SUITE

Tools That Can Spearhead Fundamental Changes in Marketing Orientations

US-based Silicon Graphics has unveiled MineSet, an integrated suite of data analysis and visual data mining tools. MineSet radically changes corporate decision-support from a lengthy batch-oriented approach to an interactive, real-time process. MineSet allows users to discover previously unknown patterns, hidden opportunities, and trends by extracting information from data warehouses and automatically mining them, using powerful algorithms, and by analyzing them through intuitive, multi-dimensional visual tools.

Initially targeted at the increasingly strategic database marketing function, MineSet empowers users such as brand managers, product managers, market development managers and data analysts with intuitive interactive data access and analysis tools. With the ability to rapidly gain new insight, users can easily transform consumer, demographic, and industry data into actionable information-fuelling, a movement from mass-marketing to customer-oriented one-to-one marketing.

MineSet integrates powerful, server-based data mining algorithms with a client-based, visual data mining tool suite that helps users analyze and understand models produced by these algorithms. Data can be accessed directly from any Oracle, Informix, or Sybase database, as well as from other data sources. In addition, users have complete control over the mapping of data and information to the visual paradigms, enabling the definition of hierarchies, aggregations, normalization, sizing, and scaling. These tools allow users to explore data through the use of multi-dimensional navigation techniques, such as 3D fly-through, drill-up, drill-down, and animation.

The first data mining algorithm available in MineSite is the Association Rule Generator, which automatically analyzes data, revealing the nature and frequency of relationships between data types. The resulting associations define a predictability model based on observed behavior. The model can be used to understand trends and forecast future results. These association rules provide in-depth information and knowledge in such application areas as market basket analysis.

Rule Visualizer graphically results from the Association Rule Generator. By analyzing rules discovered in the data mining process, users gain greater insight into the nature of a particular data set. Rule Visualizer quickly reveals the quantity and relative strengths of relationships between elements, helping to focus attention on important data entities and rules.

Tree Visualizer displays a 3D landscape that allows users to visually analyze hierarchically structured data and information. Using fly-through techniques, users can easily explore data from a "bird's-eye" perspective down to any level of detail. This visual metaphor allows users to easily pinpoint interesting data characteristics such as anomalies or exceptions, and quickly focus their attention on the most pertinent information.

Map Visualizer enables users to explore data with strong geographical relationships for identification of trends and patterns. Data is represented as graphical elements on a 3D map. Users can drill down for detailed information about specific regions or drill up to see how a particular location's data fits into its surrounding geography.

In addition, Map Visualizer includes a powerful animation feature, giving analysts the ability to identify trends by watching dependent variables in a data set evolve in relation to as many as two independent variables such as time and age. For even greater insight into data with geographical significance, multiple animations can be synchronized to present side-by-side trend parisons.

Scatter Visualizer is ide analyzing the behavior of many dimensions at once mapping data onto eleme 3D scatter plot, Scatter Vi er enables users to analyze five dependent data va using the same animation ty as the Map Visualizer allows analysts to easily trends in extremely comple sets. The combination of visual data mining tools a vanced data mining algo provides an environment ers to interactively discove veins of information abou sumer buying trends, pr relationships, and consume files. This advanced data sis capability allows mar analysts and executives t point and understand co patterns, relationships, anomalies hidden deep data, converting raw data knowledge and, in turn, int tegy and tactics.

Future releases of M are expected to include s and prediction tools as w data mining algorithms for ing powerful classification such as decision trees.

MineSet. *Silicon Graphics tems, A30 Kailash Colony Delhi 110048. Tel: 621 Fax: 6472217.*

REMOTE ROUTER

D-Link Launches Remote Router with 2 Wan, 1 Ethernet Port

Bombay-based D-Link India has introduced a remote router for the office and Internet. Called DI-1150, the router is designed to connect a branch office with the corporate head office network. The router permits Unix and NetWare users of the branch office to access the home office's databases as well as to communicate with the headquarters. The remote link can be established over the inexpensive public telephone network or on a higher speed leased line over a frame relay or X.25 network.



DI-1150: *Linking branch offices to the head office.*

DI-1150 provides one Ethernet port and up to two Wan ports. The Ethernet port connects to the branch office's local network, and the Wan port links the Wan via RS-232, RS-449/422, and V.35 interfaces. Users can install two Wan ports instead of one, to get a redundant backup link on the remote lines. Both Wan ports connect to the head office, one port being active, and the other acting as a backup in case the primary line is accidentally disrupted. The router provides automatic operation by permitting users to set up routing tables to operate independently of the complex central site routers. It provides IP and IPX ing functions, besides Ma bridging for other packet

DI-1150 is intended as an important device internetworking, where links are crucial. It elim unnecessary traffic and pr broadcasting storms on mote line. The router s most industry standard protocols including PPP, relay, and X.25. It can b nected to third party complying devices like mote routers of Cisco Networks.

DI-1150. *D-Link India, 5, Kurla-Bandra Complex Santacruz (E), Bombay Tel: 6172478; Fax: 617*

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REMOTE ACCESS SYSTEM

Shiva Corporation Launches Scalable System for Internet/Intranet Access

US-based Shiva Corporation has announced WebRover, a remote access system that provides corporate sites with a single solution for extending secure and seamless connectivity between the corporation and the Internet. The solution will be relevant for all important corporate constituencies including corporate employees sharing a LAN, remote employees dialing in from home or the road, partners and customers, and the general public.



Integrator 500: *Router in WebRover to link the corporation to the Internet.*

WebRover combines Shiva's LanRover remote access server and Shiva Integrator router products with a firewall from Raptor Systems to provide a complete solution for analog and ISDN dial-in and dial-out, integrated with dedicated access to the Internet via a leased line connection.

Specifically designed to meet the needs of corporate sites and Internet service providers, WebRover is the first offering from a comprehensive suite of technology that will expand Shiva's solutions for remote access to the Internet.

WebRover provides a complete solution for corporate sites to establish intranets, partner networks, and public networks. As a single, cost-effective system, WebRover enables secure connections for outbound access to the Internet via the leased line connection, and outbound access to other on-line services through the LanRover for LAN-based employees. It enables mobile workers to access the corporate LAN via an analog or ISDN connection and the Internet via a leased line. The firewall can be configured to allow only certain users access to the Internet. Partners and customers can access a dedicated private Web server. Because the private partner/customer network is on the inside of the firewall, users are prevented from accessing the Internet, unless authorized.

Shiva Corporation is represented in India by New Delhi-based T-Net India. The Shiva range includes NetModems, LanRover, WebRover, Access Switch, ShivaPort, and Shiva Integrator.

WebRover. *A23, Green Park, New Delhi 110016. Tel: 6510031; Fax: 3020625.*

ANTI-VIRUS UTILITY

WinGuard for Windows NT Adds On-Access Scanning to Dr Solomon's Kit

UK-based S&S International, a leader in anti-virus research, has announced the release of WinGuard for Windows NT, a kernel-mode device driver, coupled with a user-mode service. The major enhancement adds on-access scanning capability to the existing Dr Solomon's Toolkit for Windows NT. It will be incorporated in the Toolkit in the July 1996 version so that registered users will receive it automatically. Dr Solomon's anti-virus toolkit for Windows NT is available through the usual sales channels.

WinGuard for Windows NT, prevents users from running virus-infected programs and accessing macro-infected documents. It is a true 32-bit Windows application which provides fast, effective virus protection. It remains completely transparent until a virus is detected, checks boot sectors on any floppy disk accessed, and detects even the most complex polymorphic viruses.

S&S International is a software house specializing in computer security, data integrity, and network-related issues. The company's flagship product, Dr Solomon's Anti-Virus Toolkit, is universally acclaimed as a world leader in virus detection and repair utility.

S&S International products are distributed in India by IT Secure.

WinGuard for Windows NT. *IT Secure, 52 Regency Chambers, Bandra West, Bombay 400050. Tel: 6431233; Fax: 6422182.*

ATTENTION UPS/CVT MANUFACTURERS

We are doing a story titled *Choosing the Best UPS/CVT* in the August 15, 1996 issue of *PCMI*. If you think that you have the best UPS/CVT to offer, please tell us what makes your UPS/CVT the best in the country. Quality Assurance? R&D? Infrastructural facilities? And what else?

Write to:

The Editor, PC Magazine India

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BILL HOWARD

The Forces Behind Convergence

Fifteen years ago, when I was a newspaper editor and after-hours electronics hobbyist, I decided it would make sense to get a personal computer. My plan was to use it for a handful of what we now consider simple tasks: to keep a contacts list at work, type reports and letters, collate recipes, and store for all time my database of jokes. And I thought I might somehow be able to create low-res electronic contact sheets from my 2,500 rolls of black-and-white negatives. But one possibility that did not occur to me way back in 1981 was that I might be able to use a PC to store, edit, or retouch photographs. That just goes to show how difficult it can be to foresee revolutionary changes.

Similarly, it was difficult to conceive that the PC might be used someday to store, edit, and play back 8-mm home movies or their successor, the then-new Beta and VHS videotapes. One medium was digital, the other analog, and the two technologies didn't mix. Finally, this is about to change. By year's end, you'll be able to transfer and edit videotapes on your PC, and the image quality won't suffer in the least.

What you'll need is a digital video camera with an IEEE 1394 (Firewire) interface and a PCI-bus 1394 adapter card. Prices are high, but they'll come down. Digital video cameras with 1394 from Sony list for $3,000 to $4,000, but prices should fall below $2,000. Expect a 1394 adapter card to cost $300 to $500 this year. Finally, don't forget a big hard disk. The digital video compression (DVC) common to all these cameras outputs to your PC at 3.5 MBps. All this sounds pricey, and it is. Just be patient. Wait two more years and digital imaging technology will be relatively affordable.



PC PRODUCTIONS

Wait two more years and digital imaging technology will be relatively affordable.

Digital imaging is just one of the promising developments behind the steady convergence of PC and video technologies. Here are some of the other technologies and applications fueling this convergence:

- **DVD.** Originally the acronym stood for digital video disk. Now it stands for nothing, but the high-density, CD-size disk format can store audio, superb video, or 5 to 9GB of data for use with your TV, stereo, or PC.
- **MPEG-2.** This is the digital decompression method used already on the direct broadcast satellites (DBS) from RCA and Sony that give you better-than-laserdisk quality TV. DVD players will use the same video compression method. And I believe MPEG-2 will be the tool of choice for video playback on PCs once the price of the decoding hardware drops below $100. It's possible that Intel's P55C Pentium processors, due at year's end, will have enough horsepower to decode MPEG-2 unassisted.
- **Cyberspace via outer space.** Some satellite transmission receiver/decoders have serial ports on the back and give you the ability to receive data from satellites. Imagine if Microsoft could beam Windows bug fixes to you at 400 Kbps as you sleep. Or if you could use your standard modem line to request Web pages and get them downloaded via satellite.
- **Cyberspace via cable TV.** By the time ISDN finally gets its act together, it may not be fast enough. Cable modems that use the existing cable TV wiring could be the answer, although you may blanch at the thought of relying on your cable TV company to deliver a reliable 10-Mbps Internet signal.
- **PC/TVs.** Gateway 2000, Mitsubishi, start-up NetTV, and Thomson, among others, are marrying big-screen VGA monitors with TV-tuner-equipped PCs.
- **The $500 Internet appliance.** I have my doubts about its viability, but if it happens, it's going to be using a TV for its display.
- **On-board TV tuners.** For $100, you can add a TV tuner to your existing PC, and the quality is surprisingly good compared with some of the earlier efforts.
- **TV video-in and -out jacks.** High-end notebook PCs and a few desktop PCs have NTSC output jacks so you can use a big-screen TV for your laptop presentation, or input jacks so you can capture images from a video camera or TV set. You can also buy NTSC-out black boxes called scan converters to adapt an existing PC or laptop. By next year, you can expect to see more graphics boards with NTSC-out jacks.
- **PCs controlling stereos.** Sony will offer a product, VisionTouch, that lets you program your CD jukeboxes and other stereo components from your PC.

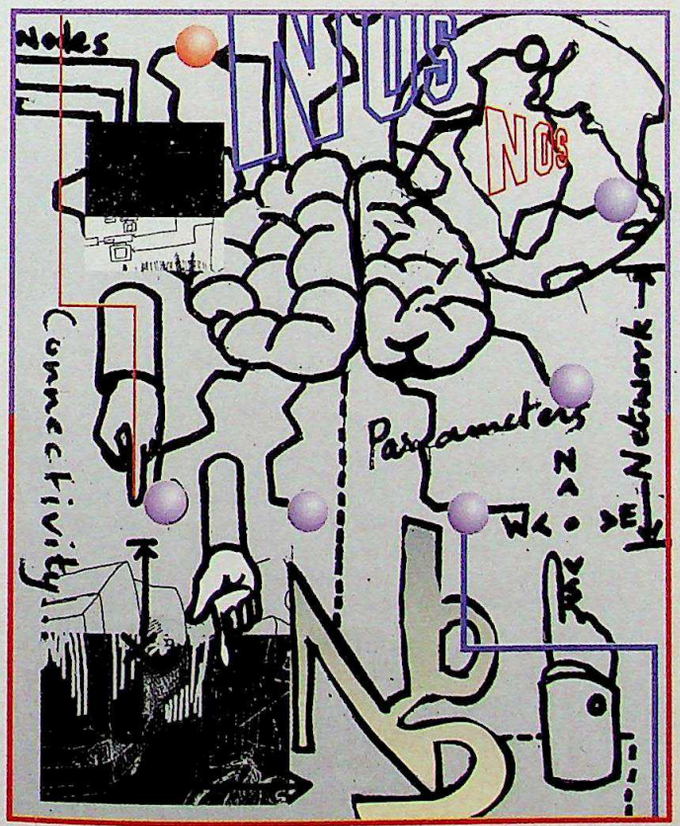
It's interesting to note that these technologies will be driven more by potential home uses than by business applications. That in itself is a big shift in the industry. □

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THE NOS EVOLVED

Network operating systems have come a long way from being simple file and print workhorses. But can one NOS fulfill all your essential network needs?



In this roundup, we evaluate the ability of four network operating systems (NOSs) to serve as your total network operating environment. We're looking for an environment that sustains and supports applications while making the connections between resources invisible. We're also looking for such essential network applications as messaging, management, and Internet access offered either as part of the NOS or as a separate application from the NOS vendor.

We had complete network environments back when we depended solely on Burroughs, IBM, or Unisys for our computing needs. The mainframe environment gave us electrical and operational connections in common, shared applications, and networkwide tools—if we stayed with one vendor. We gladly traded those confined environments for the freedom we gained when names like Novell and Banyan entered our vocabulary. More recently, IBM and Microsoft have become major network operating- system players. These are the four vendors in our current roundup.

The network environment has returned, but now, instead being one color and constraining, it's a rainbow of light and openness. It's possible, and often necessary, to blend NOSs from a couple of vendors, taking advantage of the strengths each has to offer to make things comfortable and productive in your networking biosphere.

The NOS market started an evolutionary sprint toward being an integrated environment when Artisoft and Performance Technology introduced client software that would work with many

By Frank J. Derfler, Jr.

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types of servers. Overnight, the species of special client-side networking software maintained by Banyan, Novell, and others was doomed. Microsoft followed, and now Windows 95 is the universal client, able to link to half a dozen different server operating systems simultaneously while the user is none the wiser. IBM put the same universal client capabilities into OS/2 Warp Connect.

Because of this evolutionary step and such other events as Microsoft's adoption of Novell's network transport protocol, IPX/SPX, we have software flexibility on our servers and options in our extensions to the network.

And indeed, most networks today run a blend of NOSs. One—often NetWare—may specialize in file and print functions and, in some cases, directory services. Another—often IBM's OS/2 or Microsoft Windows NT—provides services for such networked applications as messaging and databases.

In the last few years, however, vendors have begun rounding out their NOS offerings. They've added such functions as remote access, Web servers, network and storage management, and messaging—functions formerly found only in separate applications. Powerful directory or naming services have become essential to the modern NOS for managing large enterprises with multiple servers and locations.

And NOS vendors, notably Microsoft, are offering packages of separate applications to compete with third-party vendors. Microsoft offers the BackOffice suite, consisting of Microsoft Exchange 4.0, Microsoft SNA Server 2.11, Microsoft SQL Server 6.0, and Microsoft Systems Management Server 1.1. But Microsoft isn't alone. Novell offers GroupWise and ManageWise for NetWare, and IBM offers Lotus Notes and DB2 for OS/2. Later this year, IBM will offer a suite of products similar in function to that of BackOffice.

REVIEW CRITERIA

In this roundup, we set out to deter... whether an entire operating envir... ment could be supplied by a single N... vendor. We thoroughly tested 32-... NOSs with a strong file and print b... since that is the meat of most netw... today. Given the size and diversity... many of today's network environme... we required that the NOS offer s... kind of directory or naming services ... that it support DOS, Macintosh, O... Windows 3.*x*, Windows 95, and U... clients.

We also asked each NOS vendo... supply key products that could sa... the messaging, database, remote-acc... and Internet-access needs of the aver... network environment. PC Labs t... tested each NOS and its applications ... determine the power and scope of ea... as a total network operating envir... ment (see "How We Tested").

For those networks in which powe... application services are the primary n... with file and print services a second... requirement, we also look at three U... based NOSs for Intel's *x*86 systems—... laris Application Server, SCO Op... Server, and SCO UnixWare—i... sidebar. In another sidebar, we loo... Artisoft's LANtastic Power Suite, a s...

HIGHLIGHTS

Network Operating Environments

The days of the simple file and print network operating system (NOS) are long gone. Today's networks require a whole spectrum of services, including processing power to run database and messaging applications, directory services for managing multilocation, multiserver networks, multiple protocols for multi-NOS environments, Internet connectivity, remote access, and groupware. Can one NOS vendor provide everything the total network environment needs? The answer is no. But NOS vendors have been working hard toward that goal, providing new services either within the NOS or in NOS-related products.

Most networks today run a blend of network operating systems, with one—often NetWare—specializing in file and print functions, and, in some cases, directory services. As in the past, users traditionally have to resort to another NOS platform to complete their network operating environments. You'll find them using OS/2, Windows NT Server, or a Unix variant to provide process-intensive application services.

File and print services are the environmental bedrock for most networks. Whereas NetWare used to be *the* platform for file and print, the NOSs we review essentially provide the same level of file and print services, with some minor differences.

Directory and naming services are of crucial importance in widespread, multiserver organizations. Besides providing enterprise-wide access to network resources, a global directory service—such as NetWare Directory Services (NDS) or Banyan's StreetTalk—makes managing the enterprise considerably easier. Microsoft Windows NT and OS/2 Warp Server Advanced provide similar services in a domain-based architecture, which can be unwieldy when used in a large enterprise with multiple locations. None of the NOS vendors have succeeded in integrating their directory services with other NOS applications.

Microsoft's BackOffice suite comes closest to offering all the functions necessary for a total networking environment. Keep an eye on IBM's OS/2 War... Server Advanced, which IBM claims will have directory services, multiprocessor support, and a network application suite later this year.

Powerful application services are the primary need for some networks, w... file and print a secondary requirement. In contrast to the file-and-print workhorses in our main roundup, Unix-based operating systems—such as Solaris Applicatio... Server, SCO OpenServer, and SCO UnixWare—focus on delivering scalable, application-driven performance. They tend, however, not to include more general-purpose messaging or remote-access products.

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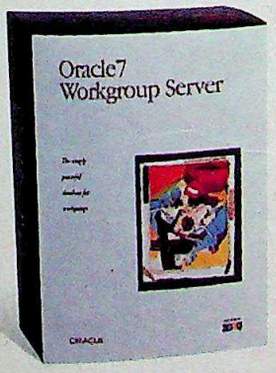
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of networking applications for small businesses and organizations. Finally, in a third sidebar we evaluate using Internet technologies to provide messaging and information services on your network.

What did we find to be the best choice among the burly 32-bit network operating systems? Now more than ever, the answer is some of the above or all of the above. While we found that Microsoft comes closest to offering a complete network operating environment, no single vendor completely fills the bill.

In most cases, you will end up running some combination of IBM's OS/2 Warp Server Advanced, Microsoft's Windows NT 3.51 Server, Novell's NetWare 4.1, and Banyan VINES 6.0 on the same network to get the desired blend of features, cost, and performance. We recommend a blend of NetWare and Windows NT for performance and flexibility, but OS/2 and Unix variants such as SCO's UnixWare can also play a role in your environment.

THE PARTS OF A NETWORK ENVIRONMENT

What makes up an environment and how do you evaluate it? There are several layers:

- *File and print.* The environmental bedrock is still sharing files and printers. The performance and capability of file and print sharing are fundamental.
- *Application services.* The ability to run messaging, database, and other server-based applications efficiently in a client/server network is an essential requirement of most modern networks. Multiprocessor support is an essential ingredient here, as are fault tolerance, high-quality development tools, and application support from third-party vendors.
- *Hardware integration.* If the system doesn't work on the hardware you have, want, or trust, then the air is too rarefied for growth. Both the type of processor and the ability to use more than one processor are big factors here as well.
- *Networking infrastructure.* This includes the ease of use of the network transport protocols and how well the server software handles multiple LAN adapters and internal routing. The rich fruits of the network environment, ranging from client/server operations to Internet access, grow from this base.
- *Internet integration.* Internet access from the network is becoming a necessity in many organizations. The ability to run TCP/IP and the Dynamic Host Configuration Protocol (DHCP) for keeping track of TCP/IP addresses on the network is key. Web server software is also important.
- *Remote access.* Business trips and telecommuting require that networks offer a solid remote-access solution.
- *Messaging and groupware.* Many organizations today rely on power groupware solutions for internal co munications. In addition to e-m group discussion and work-flow tures are essential in many cases. support for existing messaging A such as MAPI.
- *Directory and naming services.* In l multilocation, multiserver organizati directory and naming services pro enterprise-wide access to networ sources, including servers, files, app tions, mail addresses, and printers.

A blend of NetWare 4.1 and Microsoft Windows NT Server 3.51

We tested the offerings of four NOS vendors and found that no single vendor fulfills all the needs of a complete network operating environment.

Today's networks have a whole spectrum of requirements, from powerful file and print sharing to application services, Internet integration, enterprise naming services, remote access, and group collaboration. If you want to get the best of all of these functions, the answer, at least for the time being, is to mix and match NOSs.

Microsoft Windows NT Server 3.51 gets an honorable mention for its combination of good file and print capabilities, excellent application services, and the optional messaging, database, mainframe connectivity, and management applications contained in the Microsoft BackOffice applications suite. The products that make up Microsoft BackOffice integrate well with one another and with Windows NT Server to provide just about all the functions a network operating environment needs.

PC MAGAZINE EDITORS' CHOICE

Unfortunately, Windows NT Server lacks one crucial requirement for a complete networking environment: powerful naming services. Windows NT Server's naming services are based on domains, each of which can contain only one defined organization. It is possible to link domains so that users in one domain can easily access the files and services of another. The process of setting up and managing these links is, however, considerably more complex and cumbersome than working with NetWare 4.1's NetWare Directory Services (NDS) or Banyan's StreetTalk.

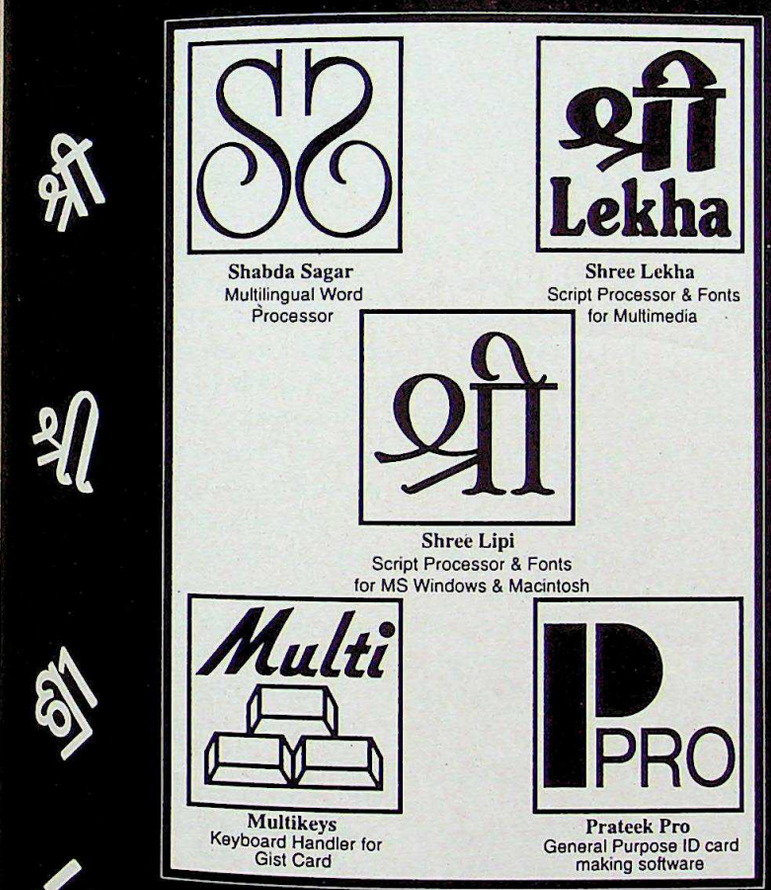
Another honorable mention goes to NetWare 4.1, from Novell. NetWare provides its own almost winning combination of top-notch file and print capabilities and powerful directory and naming services. But for running network database and messaging applications, NetWare falls short of Windows NT Server, because NetWare cannot run on any processors other than Intel's. To get multiprocessing capabilities you have to purchase a different product—NetWare SMP 4.1. And both of these Novell products still run applications in NetWare Loadable Modules (NLMs), which are potentially unstable and difficult to program.

Keep an eye on IBM's OS/2 Warp Server Advanced, which is full of valuable features and will offer directory services and multiprocessing later this year. Banyan Systems' VINES 6.0 is valuable primarily for the powerful, multiplatform directory services of StreetTalk.

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Shabda Sagar : Shabda Sagar is a DOS based **multilingual word processor** with commands that are similar to Word Star. User friendly to the core, it supports a majority of printers in use. Another attractive option is the availability of a variety of keyboard layouts.

Shree Lekha : Shree Lekha is a DOS based Indian language script processor available with **fonts for multimedia** video graphics. Its diverse features support various applications including Autodesk Animator & 3D Studio etc.

Prateek Pro : A software package for preparing General Purpose Identity cards in Indian Languages, its applications can include Labels, Tags etc also. The package includes a simple data base editor, along with an image grabbing module, flexible layout designing & printing module for use in both B/W & colour photographs as well as text.

Multikeys : Multikeys is a DOS based keyboard layout handler for Indian Languages to be used with GIST cards. It allows the use of popular keyboard layouts like Modular, Godrej, Ramington etc. Also available is a program for generating user defined layouts.

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NETWORK OPERATING ENVIRONMENTS

How to Read the Suitability to Task Boxes

SUITABILITY TO TASK

Product name	Power	Ease
File and print services	Good	Excellent
Directory and domain services	Fair	Fair
Environmental tools and	Good	Good

File and print services remain the sine qua non for most networks. The main chore of NOSs in workgroup-oriented networks is to allow local users access to files and printers. We award high marks for systems that set up quickly and easily, taking into account tools for log-on and security. We rate each product's file-system options, disk-partitioning tools, and directory and file structures. We also evaluate print queue and notification options for server-based, remote, and on-the-wire printer connections. We evaluate client integration by attaching desktop systems running multiple operating systems.

Directory and domain services are essential when networks extend beyond locally connected users. In evaluating these services we take into account organizational structure, naming conventions, the number of definable objects and attributes, the method of synchronization across servers, and the ability to discover new users, devices, and applications automatically. We also rate security, scalability, and ease of management. In determining user benefits, we look for location-independent log-on to the network and evaluate the tools provided for navigating system resources. Better services work with multiple NOSs, integrate with applications, and store data logically to reduce administration requirements.

In grading **environment tools and applications,** we look for essential network functions provided by the NOS and other products offered by the NOS vendor. We give top marks for products that provide groupware, remote access, and Internet services integrated with the underlying NOS and directory service. Stable and scalable platforms that offer application services and friendly development environments receive high marks. We also consider protocol support and the tools provided for connecting with other public and private networks.

BEDROCK

All of the products we review here provide adequate client file and print services. Under normal conditions, users can't see a difference in the time it takes to pull a file from one type of server or another.

NetWare offers more features and flexibility in its file and printing services than the other NOSs we examined. But its efficient file-server software has been a comfortable trap for Novell. NetWare's developers didn't worry about writing code for multiple processors or for RISC processors, because NetWare works so well on one Intel processor.

But database and applications servers—critical parts of a modern networking environment—crave multiple processors and the special talents of RISC processors. Novell's developers have only recently woken up to this fact, offering a multiprocessing version of NetWare called NetWare SMP. Unfortunately, NetWare SMP still houses applications in NetWare Loadable Modules (NLMs), which can be unstable and are difficult to program. Recently, Novell announced its partnership with Sun Microsystems to integrate Sun's Java with NetWare as its application framework.

When it comes to application services, Windows NT Server comes out ahead with its support for multiple and non-Intel processors, abundant APIs, and applications from third-party application vendors. Although OS/2 is also a friendly environment for application servers and has extensive third-party support, it doesn't have the hardware reach of Windows NT.

LANS TO WANS

New needs evolve when LANs connect across a wide-area network. Even finding resources and people across interconnected LANs can be a problem. VINES and NetWare each have their own powerful enterprise-wide naming services. Whether you plug your laptop into a LAN connection in the corporate skyscraper, in a small field sales office, or in an overseas manufacturing plant, the naming service lets you use the same log-on and gives you access to your standard servers and network tools.

OS/2, VINES, Windows NT, and some Unix systems use a different naming and security setup called *domains.* Like the naming services offered by Banyan and Novell, the domain system will give travelers easy access to the network, but only after an exchange of verification information takes place between domain servers that "trust" each other.

OS/2, VINES, and Windows NT servers are also more at home with the Internet Protocol (IP) than NetWare is. IP carries the favorite sorting tags of the powerful internetworking routers, while NetWare IPX doesn't convey all of the routing information of IP. The situation has improved, however, now that NetWare provides NetWare/IP.

STATIC OR GROWING?

If your organization is using a local network only to store word processing and spreadsheet files and to print, then any of these operating systems can be your environment by itself. But if your system includes a number of geographical locations and you pass information and requests for functions between sophisticated applications, you need a rich multi-NOS environment to support it.

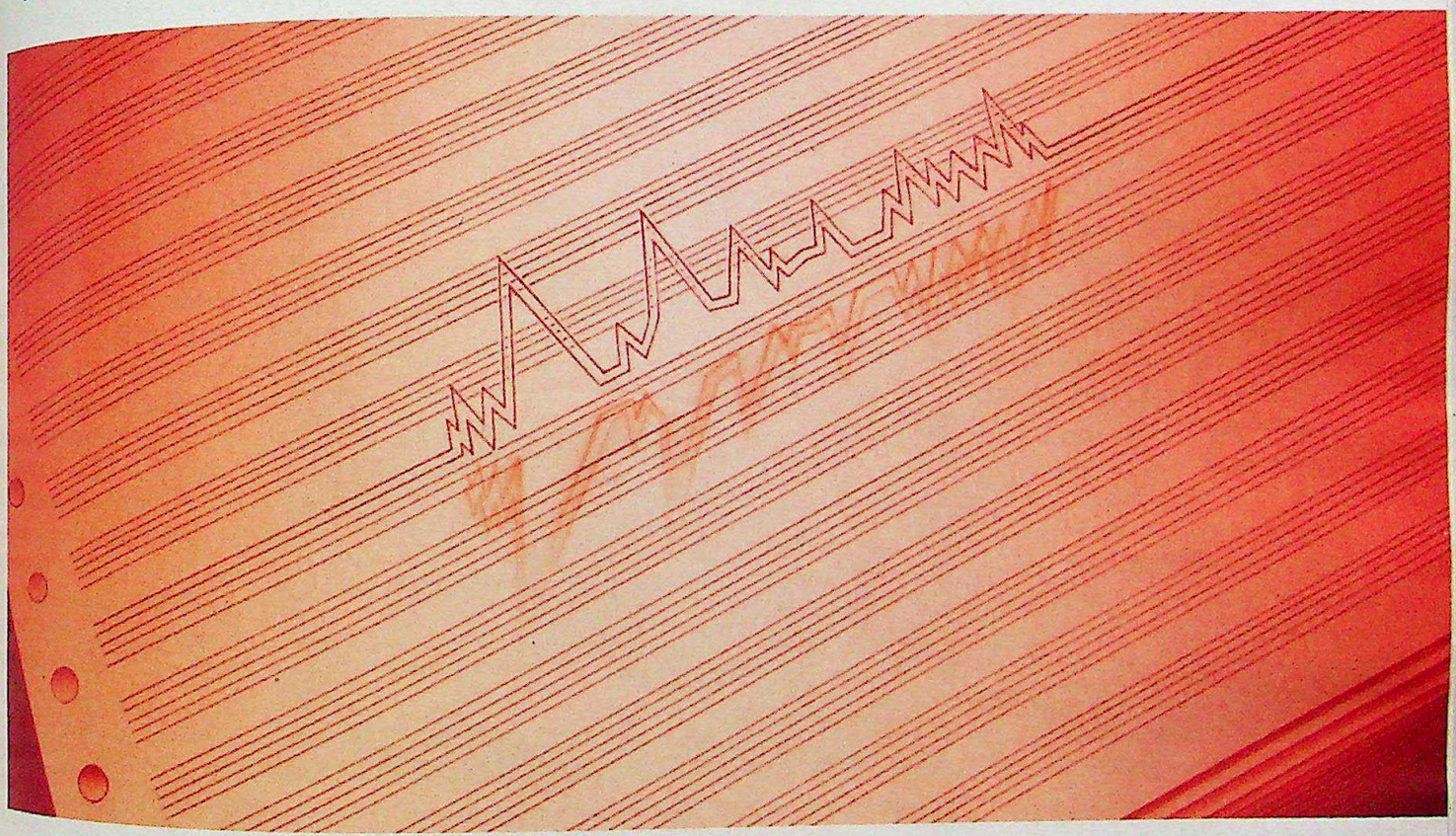
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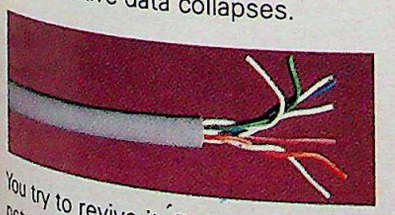
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SIEMENS

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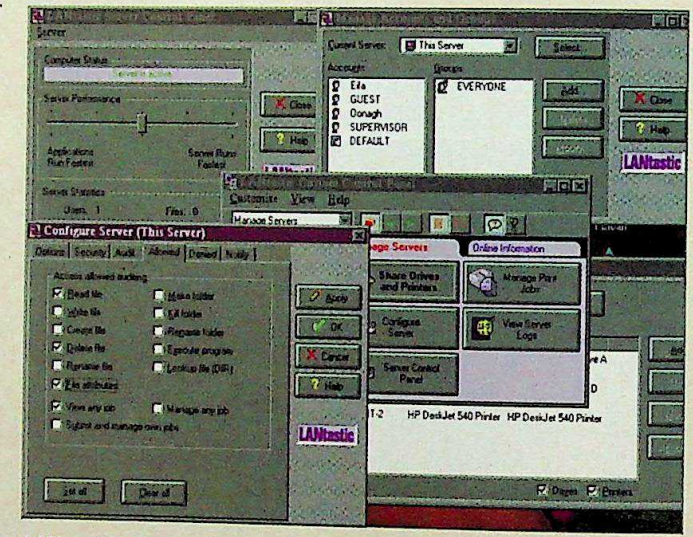
LANtastic: Network Environment on a Budget

By Padraic Boyle

If you're looking for an inexpensive way to create a small network environment, LANtastic Power Suite ($199 for one user, $1,499 for ten users) may provide all the file, print, and communications resources you need. It combines LANtastic 6.1 with Lotus cc:Mail and Lotus Organizer, Cheyenne's BitShare modem-sharing and BitWare communications/fax packages, and NetCom's NetCruiser Internet access software. The only component not available for LANtastic is a database package. We didn't include LANtastic in our main roundup, because it lacks directory services, among other advanced network services.

The heart of the Power Suite, LANtastic 6.1, is a peer-to-peer network solution that lets networked clients share one another's hard disks, printers, and CD-ROM drives. File and printer sharing are the most common uses for LANtastic and are the product's most mature feature. You can install LANtastic on just about any DOS or Windows PC to turn it into a peer-to-peer server; the minimum requirements are DOS 5.0, 5MB of hard disk space, and 4MB of RAM. The integrated installation program for LANtastic Power Suite lets you choose which components to install.

Artisoft now ships a Windows 95 version of LANtastic. Although Windows 95 and Windows for Workgroups include some peer-to-peer functionality, neither OS offers the long list of features that Artisoft packs into LANtastic. Furthermore, LANtastic allows you to network DOS and Windows 3.1 users.



LANtastic offers more extensive options than Windows 95's built-in peer-to-peer functionality, including support for multiple-client OSs.

In addition to communicating with other LANtastic users, LANtastic 6.1 can share files and printers with other NOSs including LAN Manager, IBM's LAN Server, NetWare, Windows for Workgroups, and Windows NT Server and Workstation.

LANtastic offers many of the same security features as the big NOSs but without all of the hassles. User accounts are created and managed via the Network Manager utility. An access control list (ACL) is used to allow or deny users access to data or devices on one or more servers. The ACL can be configured for individual servers or for all LANtastic servers.

If your needs grow beyond peer-to-peer file sharing, Artisoft also offers a LANtastic Dedicated Server. Architecturally based on a NetWare 3.*x* server, it can run most NLMs for NetWare 3.*x*. It costs $899 (for existing LANtastic sites).

SUITE DEAL

The products included with LANtastic Power Suite provide a rich array of services for the small office. Lotus cc:Mail is one of the most popular e-mail systems on the market. When you install cc:Mail, you must designate at least one PC on the network as a Post Office. Windows and DOS users can coexist in the same e-mail environment with cc:Mail 2.1 for Windows and cc:Mail 4.02 for DOS. Additionally, Lotus offers other products that provide gateway communications between cc:Mail and other e-mail systems, including SMTP and UUCP gateways for Internet mail connectivity.

To complement cc:Mail, Artisoft bundles Lotus Organizer 2.01—Lotus's personal information manager (PIM), calendar, and scheduler. Organizer can be used as a standalone or, for full use of the product, in the LANtastic network. In a networked configuration, Organizer offers the ability to view the schedules of others.

Another useful feature of Power Suite is Cheyenne Software's BitShare 4.0 for Windows and DOS, which lets users dial out of the network from shared modems. Cheyenne's BitWare 3.2 for Windows and 4.1 for DOS offer both data communications and fax send-and-receive packages allowing users to take advantage of online and fax services.

Rounding out Power Suite is NetCom's NetCruiser 1.6. NetCruiser offers Windows users all the tools needed to surf the World Wide Web, copy files using FTP, and telnet into remote hosts over the Internet. Users must purchase an account from NetCom—or another Internet service provider (ISP)—before they can access the Internet. And they can use BitShare's modem-sharing feature to dial out, with a single Internet access account.

Artisoft's LANtastic Power Suite covers practically all the software needs for today's small business. Power Suite even offers a file synchronization utility, PowerSync, from Linkpro, making synchronizing files between two networked computers an automatic task.

LANtastic Power Suite. List price: Single user, $199; 10 users, $1,499. Artisoft Inc., Tucson, AZ; http:// www.artisoft.com.

(No Indian partner.)

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Microsoft Corp.

Microsoft Windows NT Server 3.51

Of the products we tested, Windows NT Server, when combined with the Microsoft BackOffice application suite, comes closest to having all the features and applications necessary for a complete network operating environment. Windows NT Server is a solid platform for file, print, and application services. And Microsoft BackOffice provides the most comprehensive and well-integrated suite of server applications offered by any of the vendors in this review. Unfortunately, one conspicuous omission—a true global directory service—is a stumbling block for large organizations that need an enterprise-wide naming service.

Built on Microsoft's 32-bit, preemptive architecture, Windows NT Server comes with good file and print services and a bevy of server administrative and management tools. With its Window's graphical interface Windows NT Server is also the easiest product in this review to use. We tested the Windows NT Server with Service Pack 4, the most recent set of bug fixes and code enhancements.

Windows NT Server's strengths as an application server are well known. The operating system's abundant set of APIs provides direct access to basic services such as the file system, memory management, and symmetric multiprocessing (SMP) for up to 32 processors, easing the application development process. And, unlike NetWare 4.1 and OS/2 Warp Server, Windows NT Server supports both single and multiprocessing in one package. Windows NT Server is also available to run on Alpha, MIPS, and other systems based on non-Intel processors.

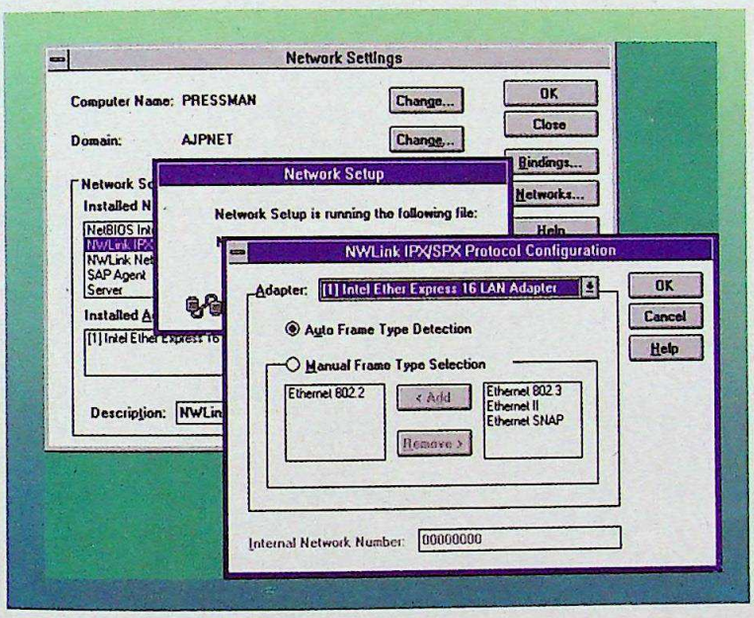
Most of Windows NT Server's tools offer the usual Windows-interface buttons and pull-down menus. But the slick veneer of Windows doesn't completely eliminate the need for an occasional look into a help file. While the Windows interface simplifies installation, some of the management tools need a little refining. For example, Windows NT Server uses separate tools for print services and user management. Combining these functions into one utility would greatly simplify administration. Version 4.0 of Windows NT Server, due to ship this summer, promises to improve the interface by replacing the existing GUI with that of Windows 95.

Networked printing under Windows NT Server is about as straightforward as it can get. Extending the Windows Print Manager metaphor, print sharing is a matter of connecting a printer directly to a server and using the Shares option to give users printer access. Windows NT Server can also run popular print servers such as HP's JetDirect or Intel's NetPort series. Consistent with Windows NT Server's theme of network independence, print servers can communicate with Windows NT servers over a variety of network protocols, including DLC, IP, and IPX.

SUITABILITY TO TASK

Microsoft Windows NT Server 3.51

	Power	Ease
File and print services	Good	Excellent
Directory and domain services	Fair	Fair
Environmental tools and	Good	Good



Microsoft Windows NT Server makes it simple to set up even complex configurations of multiple protocol and frame types.

NAME THAT DOMAIN

Windows NT Server uses a domain-based directory architecture. If its domains and access rights are properly set up, users can access any Windows NT server or resource from a single log-on. A master directory of domain information is stored on a Windows NT server called the Primary Domain Controller. Directory changes, such as the addition of a user, are immediately added to the Primary Domain Controller's directory. Each Windows NT server uses the directory and security databases from the Primary Domain Controller to determine user access rights. Backup controllers provide redundancy for WAN and remote servers, allowing remote users to remain logged on when connections are down.

In addition to administering users, Windows NT Server's directory services let administrators set permission levels to limit access to resources and file server directories. The User and Group Manager utility also lets the administrator assign users and resources to groups.

From the administrative side, however, Windows NT Server's directory services lack much of the depth and flexibility of those in NetWare 4.1 and Banyan's VINES. NetWare's NDS and Banyan's StreetTalk let you create multiple organizations in a single directory. This means you can easily segment your network into logical organizations such as "Acme International" and "Acme America." Windows NT Server only lets you define a single organization per domain. In order to share resources among several domains you have to go through a cumbersome process of setting up trusts among each set of two domains. *Trusts* enable users in one domain to access another domain's resources. This structure lets you technically set up NDS- or StreetTalk-like structures, but you still have to administer multiple directory services to maintain the trusted-domains labyrinth. Last July, Microsoft announced that it was working on Open Directory Services Interfaces (ODSI), a set of APIs that would allow compliant applications to access the directory services of any compliant NOS. The first set of specifications should be ready in mid-1996, according to Microsoft.

Windows NT Server provides a complex security system for controlling access within and between domains. An authentication process protects user information

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during log-on, encrypting passwords and user names. A series of directory and security databases store user and server information as Security IDs (SIDs). SIDs are also created when you want to link, or trust, one or more domains.

CONNECTIVITY CENTRAL

Windows NT Server's native protocol is NetBEUI, but the product also includes IPX/SPX and IP protocols, making it compatible with NetWare and TCP/IP networks. Windows NT Server also comes with the Gateway Service for NetWare, which lets non-NetWare clients running TCP/IP and connected to a Windows NT server access files on NetWare servers. Microsoft's Apple Services allow Macintosh users to store files on Windows NT servers and assign file and folder permissions that closely emulate AppleShare server permissions. Macintosh clients can also print to Windows NT printers from their regular LaserWriter Chooser icon.

With Windows NT Server, we found it relatively simple to set up complex configurations of multiple protocol and frame types.

Optional Windows NT Server products sold separately by Microsoft bring even more interoperability between NetWare and Windows NT servers. One product, File and Print Services for NetWare, makes a Windows NT server appear to NetWare clients as a NetWare 3.*x* server. Another product, Microsoft Directory Service Manager for NetWare, lets an administrator access a NetWare 3.*x* Bindery from a Windows NT server.

In addition to IP, Windows NT Server includes TCP/IP utilities, such as an FTP server, and helpful IP diagnosis tools, such as Ping. Windows NT's IP setup, which leads you through a series of dialog boxes, making it relatively simple to define IP addresses, gateways, and DNS server addresses. You still must know the IP addresses, but Windows NT Server guides you through the options. Windows NT Server also includes a Dynamic Host Configuration Protocol (DHCP) server to allocate IP addresses dynamically.

With Windows NT Server, we found it relatively simple to set up even complex configurations of multiple protocol and frame types. Hardware setup is especially simple. The product automatically detects adapter hardware and settings—as does OS/2 Warp Server—and uses pick lists and other interactive interface elements to make installation of complex networking components intuitive.

Like OS/2 Warp Server, Windows NT Server has built-in remote-access services. It uses Microsoft's Remote Access Service (RAS), allowing users to connect to Windows NT servers over analog and ISDN connections. In addition to the RAS client included with Windows 95, Windows NT RAS supports any PPP client. Once connected to the server, users can access the servers and resources as if they were directly connected to the Windows NT Server network.

Hard disk configuration tools are included with Windows NT Server. Using the graphical disk manager, administrators can partition and format individual disks with one any of the supported Windows NT Server file systems.

APPLICATIONS AND SERVICES

Microsoft's strategy to stack its Windows NT Server deck with a powerhouse of complementary applications and common services has produced a series of full-featured, robust applications and a handful of diagnostic and administration tools designed for Windows NT Server.

BackOffice, Microsoft's server application suite, comprises a half-dozen applications. BackOffice 1.5 is sold as a bundle starting at $2,199 with one administrator's license ($21,799 with 100 client licenses), or you can purchase the individual applications separately. Besides Windows NT Server, BackOffice includes the $999 Microsoft SQL Server 6.0. Developed by individual Microsoft teams, BackOffice products share a common installation program and integrate to share resources. At the time of this review, Version 1.5 of BackOffice was shipping, but Version 2.0—which includes Microsoft Exchange Server—is expected by the time you read this.

The newest BackOffice family member is Exchange 4.0 ($699 base price; $6[illegible] with 100 clients), a MAPI-compliant client/server messaging and mail system that exemplifies many integration benefits between applications and the Windows NT Server OS. Exchange, like other BackOffice products, takes advantage of Windows NT Server's directory services. If you have a change installed, you have the option of creating an Exchange user each time you create a new Windows NT Server user.

The accessibility of Windows NT Server's basic operating system functions to BackOffice products work closely not only with the OS but with one another as well. For example, the System Management Server network administration package ($649 base price; $4,349 with 100-user license) works together with SQL Server. Taking advantage of SQL Server's powerful data manipulation and efficient client-server architecture, SMS uses SQL Server to log error messages. Users can monitor SMS activity by accessing SQL Server.

Similarly, the new Internet Information Server (IIS)—Microsoft's free Web server—can use Windows NT Server to publish Exchange documents on the Web or a corporate intranet. Using the Web Connector, a plug-in Service Provider Interface, IIS can convert Microsoft Exchange public-folders documents to Web pages on the fly, extending the availability of Exchange data to Web browser users.

SNA Server ($409 base price; $4,9[illegible] with 100-user license), another BackOffice application, is a simple and flexible product for providing connecting Windows NT servers to IBM mainframes and minicomputers such as the AS/400.

All the BackOffice applications use the included Event Log and Event Viewer applications for monitoring and collecting server information. The Event Log collects error and status messages, and the Event Viewer lets you open and read the actual messages. Any application can add to the log to insert its own messages. While many third-party applications still rely on their own logs, the Event Log has the potential of being a central repository for information about all your network services.

From its powerful, scalable architecture to basic file and print services, Windows NT Server is a well-rounded network op[illegible]

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What's Available for Your NOS?

● Software available from the operating-system vendor
■ Software available from a third party
* Not available for this operating system
Each group is in alphabetical order

	Microsoft Windows NT Server 3.51	NetWare 4.1	OS/2 Warp Server Advanced	VINES 6.0	UNIX-BASED NOSs: SCO OpenServer 5	SCO UnixWare 2.1	Solaris 2.5
Groupware and E-mail							
Banyan's BeyondMail	■			●			
Beyond Share, Client/Server Version		■		■			
Deltinoi eMail	■	■	●	■			■
Lotus cc:Mail	■	■	●	■*	■		■
Lotus Notes	●						
Microsoft Exchange Server		●	■				
Novell's GroupWise							
SQL Databases	■		●	■*			■
IBM's DB2	■			■*	■	■	■
Informix-OnLine	●			■*			
Microsoft SQL Server	■	■	■	■*	■	■	■
Oracle7	■			■*			■
Sybase SQL Server 11							
Internet Servers			●				
IBM Internet Connection Server				■			
Incognito Software's WebServer for VINES	●						
Microsoft Internet Information Server	■						■
Netscape Enterprise Server 2.0		●					
NetWare Web Server NLM							■
Open Market WebServer							
Process Software's Purveyor WebServer	■	■					
Directory Services							
Banyan's StreetTalk		●		●	■		■
NetWare Directory Services (NDS)		●					
SCO OpenServer Distributed Services					●		
SunSoft's Network Information Service Plus (NIS+)							●
Other Services Available from the NOS Vendor							
Network management	Systems Management Server	ManageWise	SystemView (included)	OutLook for HP OpenView	SCO Doctor	None	Solstice
Mainframe connectivity	SNA Server	NetWare for SAA	PSF (printing), ADSM (backup)	VINES 3270/SNA	None	None	ONC+
Remote access	Remote Access Services (included)	NetWare Connect	Remote Connection Service (included)	PC Dial-in	None	None	None

* This product is available to VINES clients via native VINES IP or Banyan's Enterprise Network Services.

ting system that is equally useful for small o medium-size, single-server or multiserv- enterprise networks.—*Tony Pompili*

icrosoft Windows NT Server 3.51. Price: Rs 0,000. Microsoft Corp., Redmond, WA; tp://www.microsoft.com.

Indian subsidiary Microsoft India, New Delhi; Indian partners Datapro Infoworld, une; Godrej Trading, Bombay; Sonata, angalore; TUL, Bombay.)

ovell Inc.

NetWare 4.1

For years Novell's NetWare has been the dominant network operating system. NetWare 4.1 retains Net- Ware's excellent file and print services, on-the-fly disk compression, and top notch management tools. Other features and Novell products build on NetWare's file and print strengths to take NetWare closer to being a complete network operating environment. With NetWare Directory Services (NDS), NetWare 4.1 adds an excellent administrative directory for large multiserver, multisite Novell WANs. NetWare 4.1 also adds support for TCP/IP with NetWare IP. Novell's separate GroupWise is a robust messaging platform, and GroupWise XTD, scheduled for release in mid-1996, will come with even more groupware features and NDS support. Novell's NetWare Connect provides integrated remote access, Novell's ManageWise offers powerful management, and the recently released NetWare Web Server provides Internet server capabilities.

NetWare stumbles, though, when it comes to application services. Unlike Windows NT Server, NetWare runs only on Intel processors. And to get support for symmetric multiprocessing, you have to purchase a separate product, the recently released NetWare SMP 4.1. Like NetWare 4.1, NetWare SMP runs applications in NetWare Loadable Modules (NLMs), which are potentially unstable and, therefore, must be very carefully written. Furthermore, there is currently little integration among Novell's applications or between its applications and NetWare Directory Services.

Like Banyan Systems, Novell provides a powerful networking infrastructure that you can supplement with application services from other NOSs and third-party developers.

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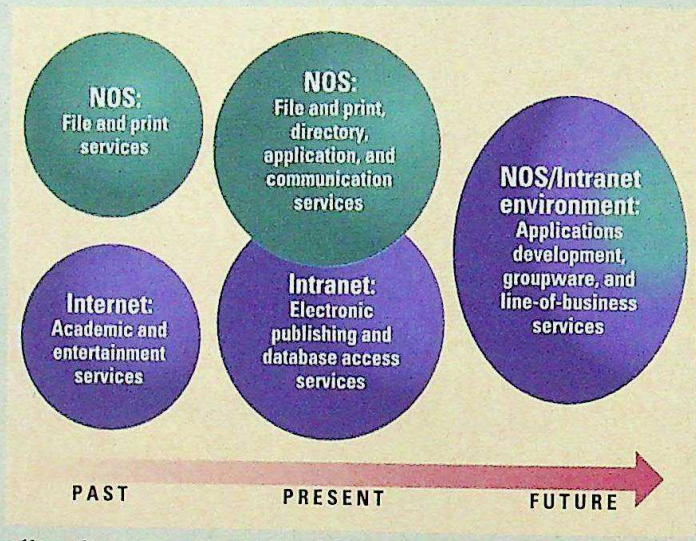
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The Intranet and Your Next Network Environment

By Robert P. Lipschutz

In this roundup, we explore some of the new services offered by the current crop of network operating systems. But many of the answers to your internal network needs can be found right outside your firewall as familiar Internet applications. What's more, we feel the network of the future will inevitably be a fusion of NOS and intranet services.

An intranet can be thought of as any networking scheme that uses standard TCP/IP services within a corporate network. One big advantage of intranet applications is that they're based on widely recognized standards, so customers aren't locked into single-vendor solutions. And although HTML pages served from http servers have made the biggest splash, other Internet technologies can also serve an intranet. Though your network environment in the future will be a blend of NOSs and Internet technologies, today you'll need to understand the overlap as well as the synergies. Here we look at four important network services: file and print, directory and naming, application, and communication.



FILE AND PRINT SERVICES

Robust file and print services are standard in most NOSs. On the intranet side, a network using Network File System (NFS), a file system developed by Sun Microsystems, can provide file sharing, but not with the fast performance of Microsoft Windows NT Server, NetWare, or OS/2 Warp Server. Also, user and group security is much better in traditional NOSs. We suggest you stay with NOSs for file and print services.

DIRECTORY SERVICES

Useful for both end users and administrators, directory and naming services connect users and groups with content and services. NOS directory services, such as NDS and StreetTalk, keep track of users, groups, files, and printers across entire enterprises. No comparable directory services are currently available for intranets, but the Internet provides useful content directories such as Infoseek and Yahoo. One combined directory service would simplify NOS and intranet management.

APPLICATION SERVICES

You can expect to see a combination of intranet and legacy applications in application services. Http clients provide an excellent front end for information retrieval from a variety of back-end databases. Web browsers are graphical, platform-independent clients with an intuitive interface familiar to many users. A three-tier approach is currently popular. An http client (the Web browser) talks directly to an http server that front-ends a standard SQL database server. Today, Common Gateway Interface (CGI) provides the mechanism for the http servers to communicate with the SQL database servers. It works, but it's slow.

Web server vendors such as Microsoft and Netscape are developing their own APIs to solve this performance problem. Application development will be easier because of standard http front ends but not dramatically, since there are not many canned applications for a Web-based environment.

Critical applications will probably continue to be housed on mainframes or RISC servers to take advantage of the better architecture, performance, and development environment they offer. Windows NT Server has made some strong inroads as an application server over the last year. Expect to see a combination of intranet and legacy applications here.

COMMUNICATION SERVICES

At the center of the information revolution is communication. Whether through e-mail or groupware, today's networks must facilitate effective collaboration. With today's networks, messaging is usually provided by such third-party applications as Lotus cc:Mail or Lotus Notes. Each package has its own particular client software, and back-end message processing is done through complicated gateways and e-mail switches.

With intranet products, everything works through standards such as SMTP, MIME, and POP3. This is an area where standards will simplify corporate networks: advantage intranets. The challenge is for the standards-based clients to match the features and functionality of the proprietary packages. Today, they just aren't there; they lack the versatile interfaces, advanced programmability, and database features of products such as Lotus Notes. Netscape will probably take the lead here with its Web-server solution based on Collabra Share.

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DIRECTORY

at makes NetWare 4.1 attractive to
s running NetWare 3.*x*? Primarily, it
NetWare Directory Services. NDS, an
-like distributed directory, provides
ntralized tool for managing multiple
Ware 4.1 servers and other network
ources. It makes creating user accounts
setting access rights a snap, especially
a multiserver environment: You create
account once and it is replicated auto-
ically to all other servers in the net-
rk. With NDS, NetWare 4.1 clients
have a single log-on to all network
ources, regardless of where those
ices reside.

NDS's hierarchical structure is much
re manageable than the domain model
Windows NT Server and Warp Server
anced. With NDS, instead of do-
ins, you create Organizational Units
OU's). To give a user access to
ources in a different OU,
u run the NWAdmin console
d drag and drop the users'
ons on the resources they
ed to access.

NDS is similar to the hierar-
ical directory services of
anyan's StreetTalk, but
DS's naming convention
more flexible. NDS does not
pose a maximum number
naming levels, whereas
eetTalk permits a maxi-
m of three (in the form
er@Group@Organization).
the other hand, with unlim-
naming levels the NDS
ucture can quickly become
y complicated if it is poorly
ned.

NDS is not, however, without its prob-
s. Currently there are few applications
t integrate fully with NDS. As a dis-
uted directory, NDS must replicate in-
mation to all other servers throughout
network. This process can result in
h-bandwidth utilization, especially
oss leased lines. Still, unlike Windows
T Server and Warp Server Advanced,
ich replicate the entire directory after
ery change, NDS transfers changes only
ong servers.

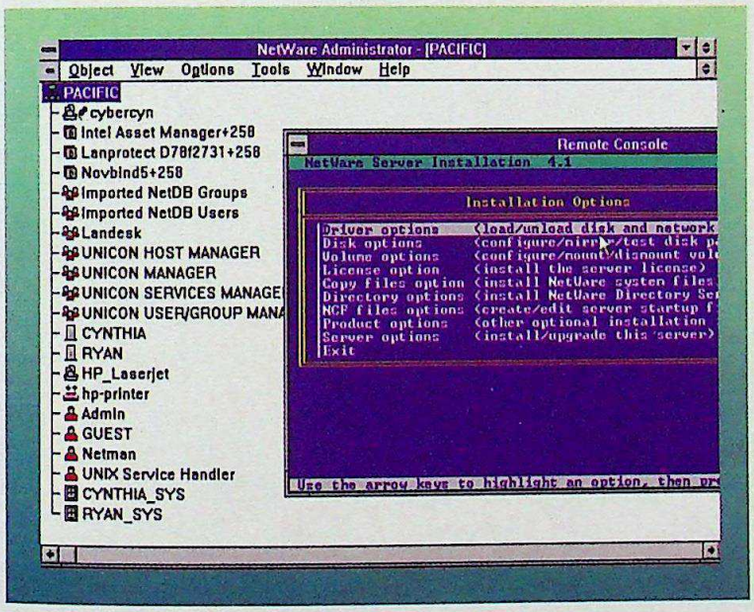
Because of its hierarchical structure,
talling NDS in a large, widespread
work can be complicated. But apart from NDS, NetWare 4.1's graphical installation is dramatically easier than NetWare 3.*x*'s. And though it lacks automatic hardware detection, a feature of Windows NT and OS/2 Warp servers, NetWare 4.1 is much simpler than VINES to install.

To encourage NetWare 3.12 users to adopt NetWare 4.1, Novell provides the Migrate utility to transfer Bindery information to NDS. Another tool, NetSync, lets you manage up to 12 NetWare 3.*x* servers from NWAdmin so that not all servers need to be upgraded at once.

SUITABILITY TO TASK

NetWare 4.1

	Power	Ease
File and print services	Good	Good
Directory and domain services	Good	Excellent
Environmental tools and	Fair	Good



NWAdmin graphically displays all of NetWare's resources, but some management tasks still require using a character-based interface.

FILE AND PRINT SERVICES

NetWare's core competency remains its robust, high-performance file service, with features such as internal routing, software-based RAID, and powerful printing functions. NetWare provides high-speed routing between multiple network adapters in a server for better throughput in a multisegment configuration. It is also the only product in our review that offers on-the-fly disk compression and suballocation.

Despite its powerful printing features, NetWare's print management is cumbersome. You can use NWAdmin to view print queues, but you must perform most printer management using two utilities, PSERVER.NLM and PCONSOLE .NLM. Both utilities are the same awkward C-Worthy applications from NetWare 3.*x*.

Managing NetWare 4.1 in general is easier than it was in previous versions. The graphical NWAdmin lets you perform most tasks (such as creating users and groups) from a single utility. Still, NWAdmin does not centralize everything. In addition to print management, rudimentary tasks such as creating disk partitions and modifying the AUTOEXEC.NCF files still require using a C-Worthy program.

For a fully redundant, fault-tolerant system, Novell offers NetWare SFT III ($1,495 for 100 users; $3,995 for an unlimited license). This solution lets you create a backup server with a configuration identical to the primary server's that mirrors the entire primary server. SFT III, however, does not yet work with some crucial services and applications, such as NetWare/IP.

NETWARE SMP

Because of its evolution as a lean, file-serving machine, NetWare has not been known for running CPU-intensive applications such as databases. Recognizing this, Novell developed NetWare 4.1 SMP, available only through third-party hardware vendors such as AST and Compaq, who bundle the product with their multiprocessor servers.

But NetWare SMP clearly is not a mature application platform. Currently, Oracle7 Server is the only product optimized for NetWare SMP. Unlike Microsoft and IBM, Novell does not sell its own database server for NetWare. Novell has promised SMP support with the next release of its GroupWise messaging product—GroupWise XTD. Another drawback to NetWare SMP is that the current implementation requires that applications be specifically written for that version of the NOS. For software developers, this means developing two versions of the software: an SMP version and a single-processor version.

NetWare also falls short when it comes to memory protection. All NLM applica-

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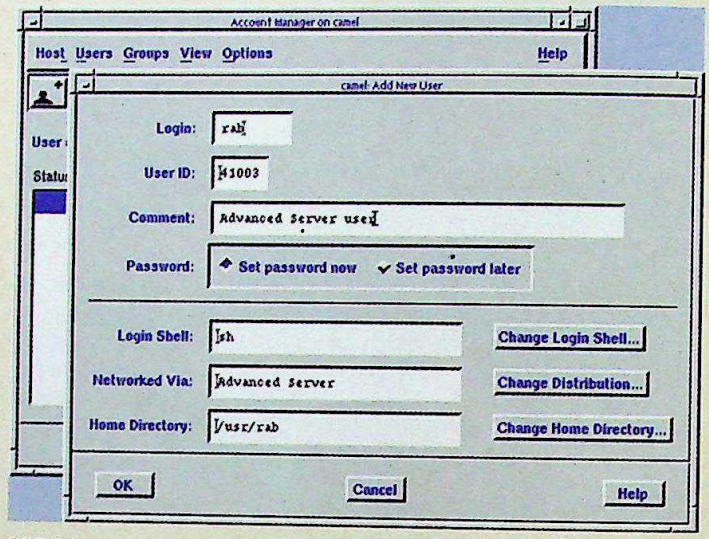
Unix Application Server, File and Print on the Side

By David S. Linthicum

Each of the network operating systems in this roundup is built around a core of file, print, and directory services. But if the needs of your network environment fall more heavily in client/server applications with file and print playing second fiddle, you may find that *x*86-based Unix operating systems such as SCO OpenServer, SCO UnixWare (purchased last year by SCO from Novell), and SunSoft's Solaris *x*86 Application Server are a better fit.

With their support for multithreading and symmetric multiprocessing, Unix-based operating systems provide a better home for client/server messaging and database applications than operating systems optimized for file and print services.

The same operating systems can also provide file and print services for both native Unix and Windows clients. But they do so either through SunSoft's Network File System (NFS), which suffers from poor performance, or by layering products such as SCO's Advanced File and Print Server over the core OS to make it look like such popular file and print servers as NetWare and Windows NT Server. For smaller network environments in which application services are a priority, one of these Unix OSs can serve as the principal NOS. In a larger environment, they can provide application services plus some extra file and print services as needed.



SCO Advanced File and Print Server provides Windows NT–compatible services for OpenServer users.

SOLARIS APPLICATION SERVER

Solaris Application Server ($2,495 for one to four processors) is a combination of the Solaris *x*86 2.5 operating system and SolarNet PC Protocols Services. Solaris *x*86 provides symmetric multiprocessing, multithreading, and excellent fault-tolerance features. SolarNet layers on top of Solaris to provide base NetWare services and the IPX/SPX protocol stack for seamless integration with existing Windows and NetWare client environments. The IPX/SPX stack is implemented in parallel with TCP/IP and is available simultaneously. NetWare clients can therefore link to the Solaris Application Server without having to reconfigure or load additional protocols.

Setting up the application server is just a matter of installing the suite of products on a single- or multiprocessing PC system. But Solaris is finicky when it comes to hardware support, so make sure you read the hardware compatibility list before you decide to purchase Solaris. Moreover, Solaris Application Server is one product in a suite of Solaris products that can be confusing, so it pays to talk frankly with your SunSoft sales representative to find the most cost-effective way to meet your requirements.

Solaris's naming service, Network Information Services Plus (NIS+), can make several Solaris servers appear as a single information system. Like other global naming services (such as NetWare Directory Services), NIS+ provides a uniform distributed mechanism for managing network resources globally.

In addition to the NetWare file and print features, Solaris provides file and print services through NFS, a component of SunSoft's Open Network Connectivity Plus (ONC+). There are third-party NFS clients available for most operating systems including DOS, Macintosh, Windows 3.*x*, Windows 95, and Windows NT Workstation.

SCO OPENSERVER

SCO OpenServer provides support for up to 30 processors and good fault-tolerant features for running client/server applications. File and print services are provided through an add-on product, SCO Advanced File and Print Server. Advanced File and Print Server is a licensed version of Advanced Server for Unix (AS/U), developed by AT&T Global Information Solutions. It's also an enhancement to SCO's previous file-and-print product, LAN Manager for Unix (LMU) and is now fully compatible with and transparent to existing Windows NT Server clients.

Advanced File and Print Server can make your SCO OpenServer–based server look like a Windows NT file server, accessible by DOS, OS/2, Windows for Workgroups, Windows 95, and Windows NT Workstation clients. But at $995 (for a five-user license) for the Advanced File and Print Server software alone, plus the cost of the base OpenServer Enterprise operating system ($1,295 with a five-user license), it has the highest per-user cost of these three products.

In addition to file and print services, Advanced File and Print Server provides Windows NT network administration, monitoring tools, and utilities, and it includes NetBEUI and

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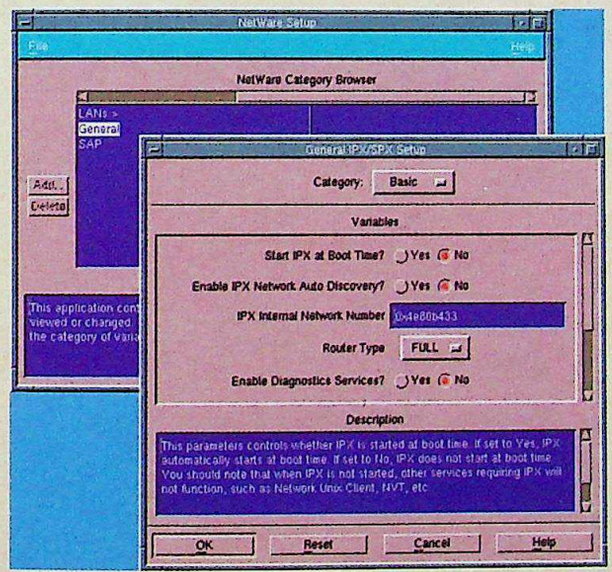
TCP/IP protocol stacks.

If you are concerned about security, you'll be happy to know that Advanced File and Print Server works directly with a trusted Windows NT domain server. Moreover, Advanced File and Print Server can share resources and user accounts in a Windows NT–compatible domain. It is also fully integrated into SCOadmin, Open Server's administration utility. Access control can be defined by user and group.

Installation of Advanced File and Print Server is just a matter of adding the software to an existing OpenServer environment through an automated installation process. Advanced File and Print Server prompts you to choose which protocols you want, automatically configures the network protocol stacks for you, and advertises the server to the clients.

File access seems slower than a true Windows NT file server, but printing performance was equivalent. Remember that you're using the SCO Open Server-based servers for application processing services as well as file and print services; performance, therefore, can vary depending on what else is tying up the disk and processor. Directory and naming services are equivalent to Windows NT, including support for long filenames.

Native Unix utilities keep the native Unix environment and simulated Windows NT server synchronized. Once Advanced File and Print Server is installed over the base OpenServer operating system, SCOadmin automatically creates the associated Advanced File and Print Server resources each time you add such resources as users or printer and file systems to SCO OpenServer.



UnixWare's NetWare integration utilities allow administrators to set such detailed information as IPX/SPX network configuration.

SCO UNIXWARE

SCO UnixWare Application Server is another example of a Unix OS that tries to look like NetWare. Until last year, UnixWare was a product of Novell, with NetWare file and print experience other Unix operating systems vendors only dream about. UnixWare acts as a NetWare 4.1 client and server simultaneously and keeps its NetWare capabilities close to the base operating system. But the sale of UnixWare to SCO could mean that UnixWare will become absorbed into SCO OpenServer, which could dilute its excellent file and print services.

At $1,695 (for 5 users, or $2,995 for 100 users) for both the base operating system and NetWare services, UnixWare is the bargain of this bunch. UnixWare is also based on the most recent version of the Unix kernel, System V Unix Release 4.2. SCO OpenServer and Solaris are based on older kernel versions, 3.2 and 4.0 respectively. UnixWare supports multiprocessing *x*86-based servers and provides a fault-tolerant file system as well as integration with TCP/IP and NetWare networking environments. UnixWare's Veritas journaling file system helps minimize downtime in the event of a power failure by logging file-system changes to disk as they occur.

UnixWare 2.1 includes NetWare 4.1 file and print services, and NetWare Directory Services (NDS), as well as the widest hardware support of these three products: 20 multiprocessing *x*86 server systems and 30 network interface cards. In addition, the base operating system is now optimized for the Pentium and Pentium Pro processors. We found UnixWare to be the best performer of the three.

As you might expect, the integration with NetWare is tight. UnixWare lets you map NetWare volumes using the UnixWare file system. It provides a NetWare Loadable Module (NLM), known as NetWare Unix client (NUC.NLM), that resides on the NetWare file server, providing UnixWare users and applications access to files on the NetWare server. UnixWare clients have access to shared NetWare printer services as well, all under the familiar blanket of NDS.

Installing UnixWare Application Server is effortless. UnixWare auto-detects most of the installation information. But there is some hands-on configuration required to add UnixWare user and group information for existing NetWare clients. Once set up, NetWare clients can log on to NetWare and browse files using either the Unix command line or built-in graphical utilities.

UnixWare also provides an MHS gateway to NetWare that allows UnixWare clients to exchange mail messages with NetWare MHS users. Moreover, a Target Service Agent (TSA) provides administrators with the ability to back up UnixWare data with NetWare's Storage Management Services (SMS) architecture.

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EVALUATION TEST-BED

Network Operating Environments

PC MAGAZINE LABS

We tested the entire network operating environment solution offered by each vendor. This included not only the file, print, security, and directory services but also messaging, remote access, Internet connectivity, and other essential network components.

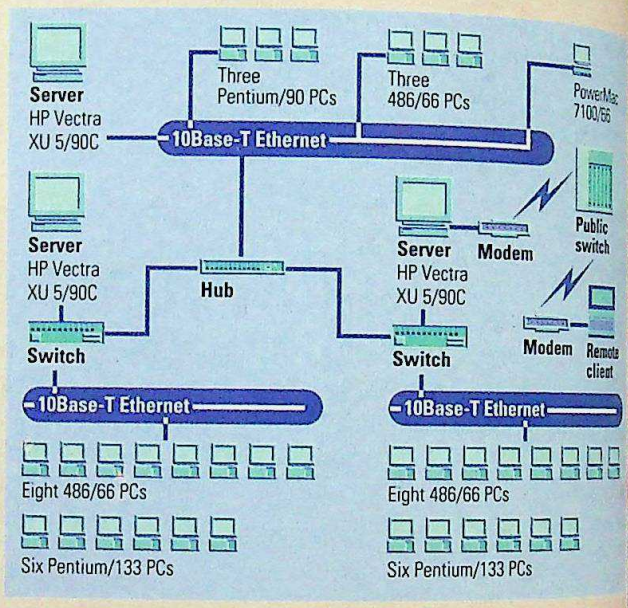
How We Tested

Today's NOSs and their additional services represent a movement away from a single-purpose network server to specialized resource servers that reside in different locations on the network. Testing these NOSs, their tools, and their applications required a test-bed to emulate a complex, heterogeneous environment.

First we installed and configured a single server to provide security and file and print sharing to eight clients variously running DOS, Macintosh, OS/2 Warp Connect, and all versions of Windows. We then tested and rated network installation, configuration, management, and fault-tolerance features.

We also examined each vendor's distributed computing framework. We added two servers and 28 additional clients to our network and ran the vendors' directory and domain services. We examined the logical rule-set or naming model to determine how well each vendor's naming service created relationships between directory objects and physical resources. We then rated the naming service's database on how well it could accommodate our simulated network. We moved and added users, groups, and physical devices to assess the distribution and synchronization of the directory or domain database.

Finally, we deployed each vendor's applications and integrated tools for database, messaging, remote access, groupware, and Internet servers. We tested the level of integration with the underlying operating system—for example, we looked at how effectively an application interfaces with the NOS's administrative and diagnostic tools—as well as the vendor's directory or domain service.—*Analysis written by Jeffrey G. Witt*



tions run at Ring 0, which offers higher performance but can cause the entire server to crash if one application misbehaves. Windows NT Server offers better memory protection, allocating to each application its own memory space. A single application, therefore, does not affect the operating system or other applications on the Windows NT Server. NetWare 4.1 does, however, let you test applications in the more secure Ring 3.

APPLICATIONS AND SERVICES

Novell claims NDS integration is crucial to an application's working seamlessly with NetWare 4.1, but very few line-of-business and vertical applications currently integrate with NDS. And many of the existing applications that do claim NDS integration actually provide very little NDS functionality. The NetWare/IP NLM, for example, is recognized by NWAdmin, but most of the management still takes place using a dedicated utility.

Novell also has not provided simple application tools, leaving NLM development for those intimately familiar with the complicated Novell C-Libraries (CLIB.NLM) and the Ring 0 architecture. In the next release of NetWare—code-named Green River and scheduled to be available by the end of the year—Novell will add NET2000, a development tool and set of application programming interfaces (APIs). Developers and administrators alike will then be able to use tools such as Microsoft Visual Basic to develop applications for NetWare.

Even with the aforementioned limitations, hundreds of third-party applications covering all categories are available for NetWare 4.1.

Novell provides several core services for NetWare. NetWare Connect ($495 for two ports; $1,995 for eight ports) is a full-featured remote-access application that provides simple remote-access service to NetWare users. Unlike with OS/2 Warp Server and Windows NT Server, re... access is not included as part of the N... Ware operating system. NetWare Conn... supports multiple connection metho... such as SLIP and PPP, but it is not as w... integrated with the NOS as the remote a... cess of Windows NT Server and O... Warp Server. A remote client prod... called NetWare Mobile ($6,995 for ... users) will have shipped by the time ... read this.

Novell's ManageWise ($795 for ... nodes) is a combination of tools that w... previously sold separately but are now ... fered as a bundle (for more informati... see "LAN Tamers," November 21, 19... These applications include the NetW... Management System (NMS) netw... management platform, NetWare LA... alyzer, and Intel LANDesk (a suite ... network management packages inclu... software distribution, hardware inve... ry, and other functions), along with ... virus-scanning software. ManageWi...

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SUMMARY OF FEATURES

Network Operating Systems

Continues

■ YES ■ NO Items listed in alphabetical order	Microsoft Windows NT Server 3.51	NetWare 4.1	OS/2 Warp Server Advanced	VINES 6.0
List price (100 users)	$3,299	$6,995	$629	$9,950
General Features				
Minimum hard disk space required	90MB	21MB	120MB	150MB
Maximum hard disk space supported	708 billion TB	32TB	Unlimited	384GB
Minimum RAM required	16MB	8MB	16MB	12MB
Maximum RAM supported	408 million TB	Unlimited	512MB	256MB
Preemptive multitasking	■	■	■	■
Cooperative multitasking	■	■	■	■
Build memory kernel	■	■	■	■
Real memory kernel	■	■	■	■
Symmetric multiprocessing	■	■*	■	■
CPU types supported:				
Intel x86/Digital Alpha	■ ■	■ ■	■ ■	■ ■
HP PA RISC/MIPS	■ ■	■ ■	■ ■	■ ■
Motorola PowerPC/Sun SPARC	■ ■	■ ■	■ ■	■ ■
Application-memory protection	■	■	■	■
Internal routing	■	■	■	■
File systems supported:				
FAT/HPFS	■ ■	■ ■	■ ■	■ ■
NTFS/VINES file system	■ ■	■ ■	■ ■	■ ■
NetWare file system	■	■	■	■
NFS	Optional	Optional	Optional	■
Native backup service	■	■	■	■
Native remote access	■	Optional	■	Optional
Peer-to-peer functions	■	■	■	■
Server Disk Options				
Data compression by file/by directory	■ ■	■ ■	■ ■	■ ■
Data-block suballocation	■	■	■	■
Transaction-based file system	■	■	■	■
Maximum file size	17 billion GB	4GB	2GB	2GB
Maximum volume size	17,000TB	32TB	64GB	24GB
Maximum partition size	Size of disk	Size of disk	64GB	2GB
Maximum volumes	25	64	26	16
Software disk striping	■	■	■	■
Duplexing/Mirroring	■ ■	■ ■	■ ■	■ ■
Software-based RAID levels supported	0, 1, 5	0, 1	1	0, 1, 5
Directory and Naming Services				
Hierarchical structure/Domain structure	■ ■	■ ■	■ ■	■ ■
Distributed database	■	■	■	■
Replicated database	■	■	■	■
Automatic synchronization	■	■	■	■
Auto-discovery of resources	■	■	■	■
Partition-independent log-on	■	■	■	■
Single-user log-on	■	■	■	■
Single-application log-on	■	■	■	■
Global network view	■	■	■	■
Object searching and browsing	■	■	■	■
Management functions from single point/ from multiple locations	■ ■	■ ■	■ ■	■ ■
Drag-and-drop of resources	■	■	■	■
Unlimited naming scheme	■	■	■	■
X.500-compliant	■	■	■	■
Cross-platform support	■	■	■	■
Predefined objects	■	■	■	■
User-defined objects/attributes	■	■	■	■
Synchronization of services and users	■ ■	■ ■	■ ■	■ ■
Access-control list for users	■	■	■	■

*This feature is available in NetWare 4.1 SMP, bundled with third-party multiprocessor servers.

not as well integrated as Microsoft System Management Server (SMS), which operates as a single application with other network services.

Novell's messaging strategy revolves around GroupWise ($1,320 for ten users). GroupWise offers e-mail capabilities, group scheduling, and even some impressive telephony features that can integrate your e-mail in-box with your voice mail. But the product does not yet have the advanced discussion capabilities of groupware products such as Lotus Notes. The next version, GroupWise XTD, will include discussion features and full integration with NDS.

Internet tools for NetWare have been scant until recently, partly because NetWare runs on its own SPX/IPX protocol instead of TCP/IP. The free NetWare/IP 2.2 brings enhanced TCP/IP functionality to NetWare LANs, providing Dynamic Host Configuration Protocol (DHCP) capability to allocate IP addresses dynamically. NetWare could start to make inroads as an Internet platform in conjunction with the recently released NetWare Web Server ($995) from Novell; Novell's LAN WorkPlace ($995) and LAN WorkGroup ($6,995 for 100 users), which provide MS Windows and DOS users with a TCP/IP stack; and third-party tools such as Firefox's NOV*IX for NetWare ($11,795 for 100 users), which acts as a IPX-to-IP gateway.

NetWare 4.1 is still an attractive file and print server, and NDS provides large networks with an excellent management tool. But NetWare's complex application-development environment could impede its acceptance as a complete network operating environment.—*O. Ryan Tabibian*

NetWare 4.1. Price: 5 users, Rs 35,950; 25 users, Rs 118,950. Novell Inc., Provo, UT; http://www.novell.com.
(Indian subsidiary Novell Software Development India, Bangalore; Indian partner Onward Novell, Bombay.)

IBM Corp.

OS/2 Warp Server Advanced

With OS/2 Warp Server Advanced, IBM has integrated many of the functions necessary for a full network operating environment into the NOS itself. In addition to basic file and

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SUMMARY OF FEATURES

Ends

Network Operating Systems

■ YES ■ NO

Products listed in alphabetical order	Microsoft Windows NT Server 3.51	NetWare 4.1	OS/2 Warp Server Advanced	VINES 6.0
Network Security				
Password restrictions:				
Aging	■	■	■	■
Force changes	■	■	■	■
Encryption across the wire	■	■	■	■
Specify length	■	■	■	■
Account expiration by date	■	■	■	■
Offers intruder detection and lockout	■	■	■	■
Limit resources by user name	■	■	■	■
Limit resources by group	■	■	■	■
Access-control on per-file basis	■	■	■	■
User disk space can be limited	■	■	■	■
C2 certification:				
Orange Book	■	■	■	■
Red Book	■	■	■	■
Network Printing				
Supports printers on server/client/wire	■■■	■■■	■■■	■■■
Allows multiple queues for one printer	■	■	■	■
Allows multiple queues for multiple printers	■	■	■	■
PostScript support	■	■	■	■
Remote queue management	■	■	■	■
Protocol Support				
AppleTalk	■	■	■	■
DHCP	■	■	■	■
DLC	■	■	■	■
IPX/SPX	■	■	■	■
NetBEUI	■	■	■	■
NetBIOS	■	■	■	■
TCP/IP	■	■	■	■
TCP/IP tunneling	■	■	■	■
VINES IP	■	■	■	■
Server Management				
Offers remote console	■	■	■	■
Alert notification	■	■	■	■
Remote control of client	■	■	■	■
Software distribution	Optional	Optional	■	■
Console displays:				
Error and system status logs	■	■	■	■
Cache utilization	■	■	■	■
Hard disk information	■	■	■	■
LAN driver statistics	■	■	■	■
Logical-disk statistics	■	■	■	■
Number of open files	■	■	■	■
Paging statistics	■	■	■	■
Percentage of CPU utilization	■	■	■	■
Physical disk statistics	■	■	■	■
Session statistics	■	■	■	■
CMIP agent	■	■	■	■
DMI agent	■	■	■	■
SNMP agent	■	■	■	■
Client OS Support				
DOS 3.*x* or later	■	■	■	■
Macintosh System 7.5	■	■	Optional	■
OS/2 2.11 or later	■	■	■	■
Windows 3.1	■	■	■	■
Windows 95	■	■	■	■
Windows NT Workstation 3.5	■	■	■	■
Windows for Workgroups 3.11	■	■	■	■

print services, Warp Server Adva... comes with LAN Distance remote-a... software and a group of utilities for ... system management, software distri... tion, software and hardware inven... and network backup and restore. And... though Warp Server Advanced do... yet support symmetric multiproce... (SMP), it works well as an applica... server OS for many existing applicat... including IBM's own DB2 database ... er, Lotus Notes messaging and groupw... and the IBM Internet Connection Ser... Gupta, Oracle, and Sybase also offer d... base products for Warp Server Adva...

IBM plans to integrate SMP into W... Server Advanced later this year, but ... like Microsoft Windows NT Server, W... Server Advanced will continue to ... only on Intel microprocessors. Later ... year IBM also plans to offer a suit... back-end applications similar to Mi... soft BackOffice.

One major piece missing from W... Server Advanced's network environm... is full, global directory services simila... Novell's NDS and Banyan Syste... StreetTalk. So for now Warp Server ... vanced works best as a solution for s... to medium-size networks. Later this y... however, IBM plans to introduce its ... global directory services component a... add-on to the NOS.

Before OS/2 Warp Server, you ha... purchase two packages—OS/2 and O... LAN Server—and do two separate ins... lations in order to get your OS/2 L... Server network up and running. Not ... more. Based on the 32-bit OS/2 Warp ... nel, Warp Server Advanced incl... OS/2 LAN Server.

TWO FLAVORS

OS/2 Warp Server Advanced supports ... to 1,000 users on a single server. F... smaller networks there is the basic O... Warp Server, which supports about ... users per server for file and print shar... The basic Warp Server lacks IBM's Hi... Performance File System and many of ... fault-tolerance and management featu... of the Advanced product.

Warp Server runs TCP/IP and p... vides a gateway to IPX for NetWare ... and print services. Warp Server ... vanced also includes what IBM calls ... namic IP, which integrates the Dyn...

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Host Configuration Protocol (DHCP) and Dynamic Domain Naming Services (DDNS) to make it easier to keep track of the TCP/IP address on your network.

While fairly easy to install, Warp Server Advanced had a slight problem with client server configuration. Like Windows NT Server, Warp Server Advanced automatically detects hardware during installation and includes drivers for more than a hundred network adapters. The installation routine properly detected our 3Com adapter, but it did not load the driver until we manually entered the card's Ethernet address. We didn't find this problem mentioned in any of Warp Server Advanced's documentation. After we cleared that hurdle, installation proceeded smoothly, and Warp Server let us choose whether to install such additional components as remote access, backup, and management.

DOMAIN EVENT

Warp Server Advanced uses a domain structure similar to that of Windows NT Server to provide a directory of all users and resources on the network. You can set up domain controllers to monitor multiple servers and domains. A domain controller keeps track of all of the users, resources, and security information for all of the servers in the domain. You can also build accounts and define privileges for users in more than one domain, so that users can access servers in multiple domains with a single log-on. This requires more work than setting up trusted domains in Windows NT Server.

Unlike NetWare Directory Services (NDS) or StreetTalk, Warp Server Advanced's domains do not provide global management capability. With NDS, for example, you can use a single PC to set up all of your users, servers, and other network resources; it doesn't matter where the server is or how many servers you have. IBM's global directory service, called Directory and Security Services (DSS) and scheduled to be available by mid-1996, will allow you to manage users and resources from a single location. DSS, which like NDS and StreetTalk, provides a hierarchical network naming structure, is based on the Distributed Computing Environment (DCE) initiative from the Open Systems Foundation (OSF) and provides a standard infrastructure across the entire corporate network.

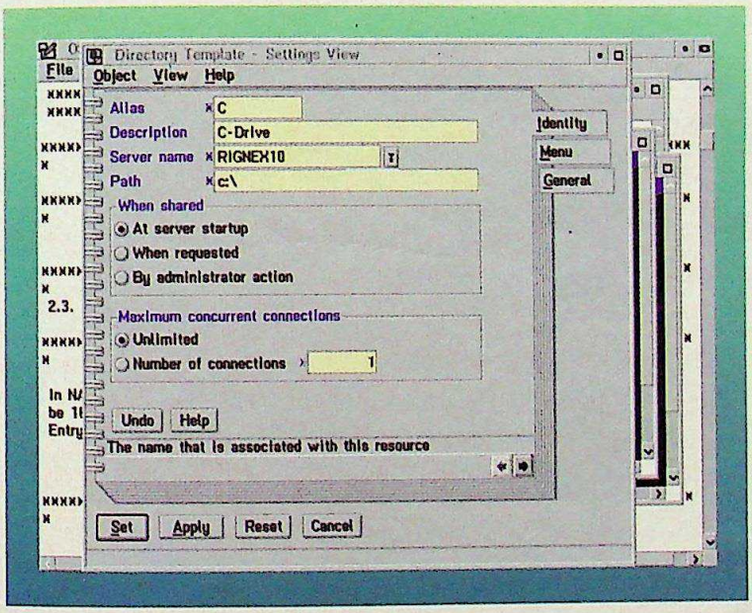
FILE AND PRINT SERVICES

Similar to Windows NT Server, Warp Server Advanced file and print services function completely in peer-to-peer mode. Warp Server Advanced comes with all the software you need to let any network user with the appropriate rights share drives and printers with other Warp Server Advanced file servers and with PCs running Warp Connect, DOS, Windows for Workgroups, and Windows 95. Using Warp Server Advanced's Gateway Services utility, you can also connect to a NetWare server and give clients on the Warp Server Advanced LAN access to NetWare drives and printers. IBM also offers Macintosh client software, sold separately.

SUITABILITY TO TASK

OS/2 Warp Server Advanced

	Power	Ease
File and print services	Good	Fair
Directory and domain services	Fair	Fair
Environmental tools and applications	Good	Fair



OS/2 Warp Server's templates use a familiar tabbed interface to set up shared directories as well as other resources such as printers.

Warp Server's Advanced Printing Services (APS) allow bidirectional communications with some printers, such as those from Lexmark. The bidirectional feature allows clients to receive such response codes from printers as an out-of-paper message. APS also allows you to print to large, line printers that are connected to minicomputers and mainframes. The most exciting feature of printing in Warp Server is the ability to send PostScript jobs to non-PostScript printers.

APPLICATIONS AND SERVICES

By the time you read this, IBM will have announced its back-end application suite, code-named Eagle. These products will include new versions of IBM's database and transaction servers. All of these products will be more tightly integrated with the Warp Server Advanced OS, including a smart install option that determines what platforms you are running, according to IBM. IBM is also working on a new version of its OS/2-based Web server, Internet Connection, that will be free to Warp Server Advanced users. Currently IBM sells the Internet Connection Server for $799.

Some of our favorite features of Warp Server Advanced are the SystemView administrative and management tools, which are bundled with the base NOS. With SystemView, you can keep a detailed software and hardware inventory of all of your client PC and server systems on the network. You can also distribute software updates to all of your client PCs and control software licenses. In order to gather information and monitor other PCs, you must install the SystemView agents on all your PCs. The agents are included in the client license and are part of the client software.

On our tests, we were able to determine the type of CPU, amount of RAM and disk space, and even the applications installed on all of our network PCs. The System Management tools also allow you to monitor the performance of your file server and allocate available system resources to clients. OS/2 Warp Server also offers a more powerful server management solution in NetFinity. NetFinity lets you manage all of your servers—even NetWare servers—from a central location and

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provides detailed hardware information.

Unlike NetWare, Warp Server Advanced comes with powerful remote-access software. Remote Connection Service (RCS), which is also sold separately by IBM as LAN Distance, allows you to establish as many as 128 remote-node connections to a single Warp Server Advanced system. (For more information, see "The Art of Being Remote," August 1995.) You can connect using most network protocols, including IPX, NetBEUI, and TCP/ IP, from DOS-, OS/2- and Windows-based PCs. In general, however, RCS is complicated to set up and use unless you are calling from an OS/2 client.

With its well-honed StreetTalk III, VINES 6.0 provides the strongest directory services of any product in this review.

In addition to these built-in utilities, IBM offers two powerful database applications—DB2 and Lotus Notes. DB2 ($369 for a single-user license; $1,495 for multiple users) is a powerful database server that runs on several different platforms, including Warp Server Advanced. It allows you to exchange information between mainframes, minicomputers, and PC-based LANs. We found it easy to install, but DB2 will require weeks to master if you're unfamiliar with it.

For groupware and e-mail, IBM's strongest solution is Lotus Notes. The most powerful and best known groupware platform on the market, Notes ($495 per server) allows you to host threaded discussions among users on the network, share data, and write custom work flow applications. Notes is not limited to Warp Server Advanced; it's also available for other NOSs, including NetWare and Windows NT Server. IBM plans to continue to offer Notes on multiple platforms but has promised to provide the best integration with Warp.

IBM offers another family of strong messaging products, MQSeries ($495), for Warp Server Advanced. MQSeries is both a messaging and transaction service that runs on 21 different platforms, including all IBM platforms and Unix flavors from Digital, Hewlett-Packard, and SunSoft. Two of the strongest selling points of MQSeries are its guaranteed delivery and its ability to exchange data between PCs and mainframes. IBM is also working on providing tighter integration between Lotus Notes and the MQSeries middleware.

Warp Server Advanced includes an impressive set of built-in utilities and an even more impressive choice of optional products. But though IBM has laid the groundwork for providing an entire solution, it's missing a powerful directory service and a directed back-end application suite. IBM has promised both of these in the near future, but until then you need to find these features in other products.—*Ste e Rigney*

OS/2 Warp Server Advanced. Price: Rs 55,000. IBM Corp., Armonk, NY; http://www.ibm.com.
(Indian partners TISL, Bangalore; SMILE, Bombay.)

Banyan Systems Inc.

VINES 6.0

With its well-honed StreetTalk III, VINES 6.0 provides the strongest directory services of any product in this review. Its file and print services are good, and Banyan's messaging offerings—BeyondMail, Microsystems Software's CaLANdar, and Netscape's Collabra Share—provide an excellent productivity platform. BeyondMail is especially well integrated with StreetTalk and VINES's Intelligent Messaging III. Where VINES falls short as a total network environment solution is in application services: It is limited by a maximum file size of 2GB, meager third-party application development, and poor performance. Finally, Banyan offers little in the way of Internet or remote-access solutions. But Coordinate.com, Banyan's recently formed Internet division, may address some of these concerns.

VINES also has some weaknesses that lie beneath the surface: an aging Unix operating system, occasionally arcane management procedures, and the most limited server hardware support of the products we reviewed. Although Banyan does its best to shield VINES users from its U- roots, our installation was difficult. A prominent example: VINES has no ba- ware auto-detection as do Windows Server and Warp Server Advanced.

The VINES supported hardware li- still quite meager, but a develope- toolkit now allows third parties to de- op VINES drivers for SCSI and netw- adapters. Most of our initial installa- time was spent loading options one one into our server key—a parallel-p- device that VINES requires. Long-ti- sufferers of this anachronistic protect- ism will be elated that the next VINES- lease will do away with parallel-port d- gles entirely.

VINES file and print services are on par with their peers. Both server- an workstation-connected printers are su- ported. Keeping client data safe requ- rigorous backup procedures, and VINE- base-level backup functionality exce- that of Windows NT Server but falls short of Warp Server Advanced's. We found that Banyan's Enterprise Back and Restore ($3,000 with two agents)- separately sold version of Legato's N worker—gives more complete protect- for both server and desktop disk dri-

DIRECTORY SERVICES

As the granddaddy of LAN-based dir- tory services, StreetTalk III remains simplest to execute and maintain.

StreetTalk's three-tier naming co- vention (in the format User@Group@O- ganization) is less flexible than NDS's hi- chitecture, which lets you nest propert- infinitely. But the use of StreetTalk A- tributes, along with the Nicknames fe- ture, gives the system sufficient malleab- ity, and the tier limit makes for le- clutter. Attributes—any additional inf- mation assigned to a StreetTalk object- can be ascribed by an administrator- third-party developer for their own p- poses; unlike NDS schema extensio- they need not be globally defined. Ni- names lets you assign a simple, one-w- alias to resources as well as to users.

Another advantage of StreetTalk o- NDS is that, in the StreetTalk archi- ture, each VINES server is respons- only for the groups residing on it. So- like with NDS, adding a user results i- server-to-server traffic.

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StreetTalk is also available for multiple platforms, a capability NDS lacks. Enterprise Network Services (ENS) is Banyan's StreetTalk directory ported to several more robust Unix variants and Novell's NetWare. ENS allows NetWare, Unix, and native VINES clients to share a common directory system and use a common directory service for a cohesiveness unmatched by any other current NOS. Banyan also recently announced StreetTalk for Windows NT, which allows VINES users to access Windows NT Server's file and print services directly.

In older versions of VINES, when a user's home server went down, that user was denied access to the entire network. Recognizing this weakness, Banyan added group shadowing feature to StreetTalk in VINES 6.0. It lets you specify secondary and tertiary servers.

With much of the StreetTalk information distributed across the enterprise, VINES users can call upon the StreetTalk Directory Assistant (STDA) for faster resource lookups. STDA, which resides on a user's local server, scans all servers on the network periodically to gather relevant StreetTalk catalog information. While STDA helps mitigate unnecessary bandwidth usage, the information is not delivered to users in real time.

ADMINISTRATION

VINES requires that some administrative duties such as hardware configuration take place at the server console, but the graphical ENS Management Tool (MT) now takes much of the drudgery out of day-to-day operations. ENS MT, which runs on a Windows client, allows varied resource search methods and uses a Windows options interface. Administrators running ENS for NetWare can manage their Novell servers from ENS MT also, but this requires both IPX and VINES IP protocol stacks.

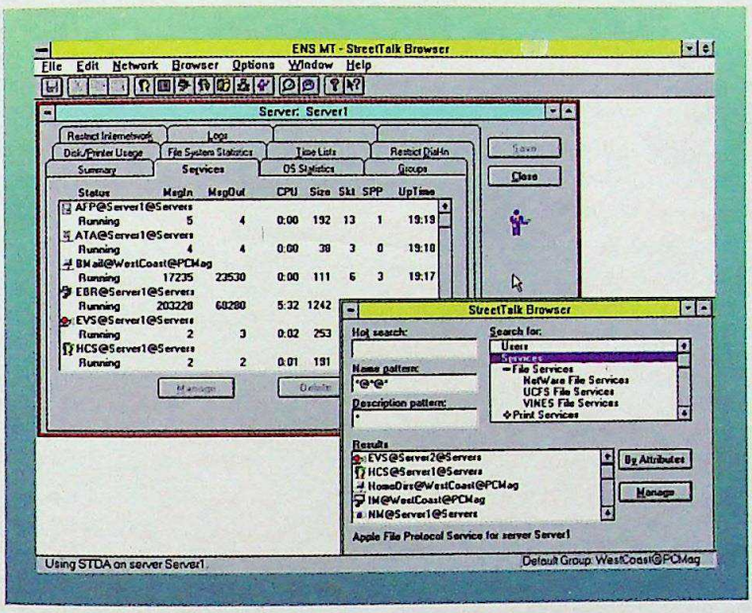
Along with ENS MT, we tested Banyan's OutLook for HP OpenView ($3,290 with one agent), which is a Simple Network Management Protocol (SNMP) management platform. OutLook extensions allowed us to view SNMP devices while monitoring and managing our VINES test servers. And in addition to automatically mapping our installation, OutLook let us view and graph such server statistics as CPU usage and system loading.

We found basic SNMP setup on the VINES server simple enough, but the voluminous documentation for Banyan's optional History Collection Service left us reeling.

SUITABILITY TO TASK

VINES 6.0

	Power	Ease
File and print services	Good	Fair
Directory and domain services	Excellent	Excellent
Environmental tools and applications	Fair	Fair



VINES includes the ENS Management Tool, which lets you browse detailed StreetTalk information for all of your network resources.

SCALABILITY

As an option, VINES supports multiprocessor hardware, but other aspects of this NOS hamper its scalability—namely VINES's 2GB maximum file-system size. With corporate data migrating to PC-class servers, this limitation has become increasingly problematic. Banyan's StreetTalk for Windows NT, which allows users to host VINES files on Windows NT Server, can circumvent this shortcoming, as can installing Banyan's ENS on another server.

VINES supports most major protocols, and it can tunnel VINES IP over IP, IPX, and even SNA. With none of the hassles associated with traditional TCP/IP, such as having to assign IP addresses manually, native VINES IP is much easier to use. But for sites looking to run only IP, Banyan offers client software for TCP/IP. Wide-area connections over ISDN, Frame Relay, T1/E1, X.25 and dial-up lines are all possible using Banyan's Intelligent Communications Adapter.

APPLICATIONS AND SERVICES

Banyan's approach to network services is different from Microsoft's and IBM's. While Banyan doesn't offer an SQL database itself, users can deploy a powerful system using Banyan ENS with IBM's AIX, HP-UX, or Solaris, and the database of your choosing.

Banyan does, however, offer a powerful amalgam of messaging software products that are deeply integrated with one another and the underlying NOS. All the applications use StreetTalk for user data and Intelligent Messaging III as the message-transport layer. Banyan's BeyondMail (standard version, $4,500 for 100 users) has very powerful rules-processing abilities. A new version now fully supports POP3 and SMTP mail protocols and makes it possible to embed such items as URL links in messages.

Best of all, not all users must be running the BeyondMail client software to exchange e-mail with one another. After creating a message using the BeyondMail Windows client, we retrieved it with VINES mail on an OS/2 system.

Two other packages, Netscape's Collabra Share ($6,995 for 100 users) and Microsystems Software's CaLANdar ($595 for 10 users), a group scheduling product, help flesh out Banyan's groupware strategy.

Rounding out Banyan's messaging solution, both packages make good use of VINES' infrastructure via the StreetTalk directory, STDA, and Intelligent Messaging III services.—*William F. Katz* □

VINES 6.0. List price: $9,995. Banyan Systems Inc., Westborough, MA; http://www.banyan.com.

(Indian partner Datamatics, Bombay.)

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Breaking the Law

The first law of photography is "Never go into the field with untested equipment." I broke that rule—big-time. The morning of the day I flew with my family to Greece for an eight-day tour, I picked up an Epson PhotoPC. Without even reading the manual, I loaded the software onto my Gateway Liberty subnotebook and tossed them both into my bag. Of course, we had three other cameras, so we wouldn't come back empty-handed in case it all went wrong.

The PhotoPC is a breakthrough product in digital cameras. It captures an image with full 640-by-480 resolution and 16 million colors in a camera that costs less than $500. In its standard 1MB configuration, it holds up to 16 images, which you then upload to your PC via a supplied serial cable. The camera compresses the images into JPEG format, so depending on the content of the images, you can actually get more than 16 into memory. We got 20 in there a couple of times.

The camera came out on the plane, and we passed it around, taking pictures of others in our group. I uploaded the pictures to the laptop on the spot. Before the trip was over, I had more than 200 images on the hard disk. I edited some with the included EZ Photo software, others with Paint Shop Pro. EZ Photo, from Storm Software, lets you adjust color, brightness, and contrast, as well as the cropping. Paint Shop Pro, a shareware program from JASC, offers a full range of digital filters and manipulations.

In use, the PhotoPC is utter simplicity. It's a fixed-focus, point-and-shoot device, although its f5.6 lens and relatively "fast" charge-coupled device (CCD) let it see everything from 2 feet to infinity. An LCD and a few buttons atop the camera let you set the resolution, flash mode, and self-timer. You can also clear the last picture you took (handy if you know you've messed up) or erase all the pictures stored in memory. You have to be careful not to flick the camera off for a couple of seconds after you take the picture; the CCD is progressively scanned into memory as the image is compressed. Turning it off produces an image that's complete but with a part that's lower in resolution and contrast. (A small LED flashes to remind you that the camera's working, but it's easy to overlook.)

I found myself yearning for a zoom lens. Our compact Minolta and Ricoh cameras were far more flexible in framing shots and getting close-ups. Battery life was better than expected. Despite the dire warnings in the manual that the camera drains the batteries heavily during upload, the four AA alkalines, which had already lasted for 150 pictures, were not fully exhausted when I replaced them. I also spent some time controlling the camera from my laptop, an operation for which Epson recommends an external AC adapter. Sorry, guys. I couldn't find a plug on the Acropolis. I wished for the optional memory upgrade, too. Dragging a laptop around with you to upload pictures a couple of times a day is no fun.

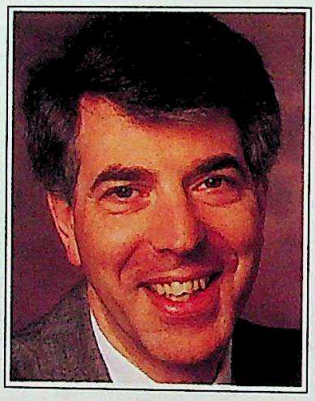


PHOTO OP

OK, so I dragged a notebook with me on vacation—and uploaded some great digital shots.

The effort was worth it, though. The pictures look great on our big-screen TV set, which I coupled to the computer through a TelevEyes Plus VGA-to-NTSC converter. Digital photography really shines in this arena. I put together a slide show on the spot by copying the pictures I wanted into another directory, then using WinJPEG, a $6.99 shareware program, to display them in slide-show fashion. My 11-year-old son took a laptop to school with the TelevEyes converter to show his classmates some highlights from the trip (but the principal banned nude statues).

PhotoPC's image size and resolution are perfect for TV display—more resolution doesn't get you a better image. But what if I had taken a camcorder and used a Snappy Video Snapshot to make stills? Or, in this age of 1-hour developing, how about scanning the prints? The Snappy can make impressive stills from tape, and the higher resolution can be beneficial if you need to crop the image. But I got even better results scanning in standard photographic prints with the new Logitech PageScan Color scanner. It stands to reason: Emulsion-based photography has an inherent resolution in the thousands-of-dots-per-inch range, with nearly continuous color gradations. The PageScan scans at 200 dpi, giving you some overhead for cropping. But for one-step camera-to-PC simplicity, the PhotoPC can't be beat.

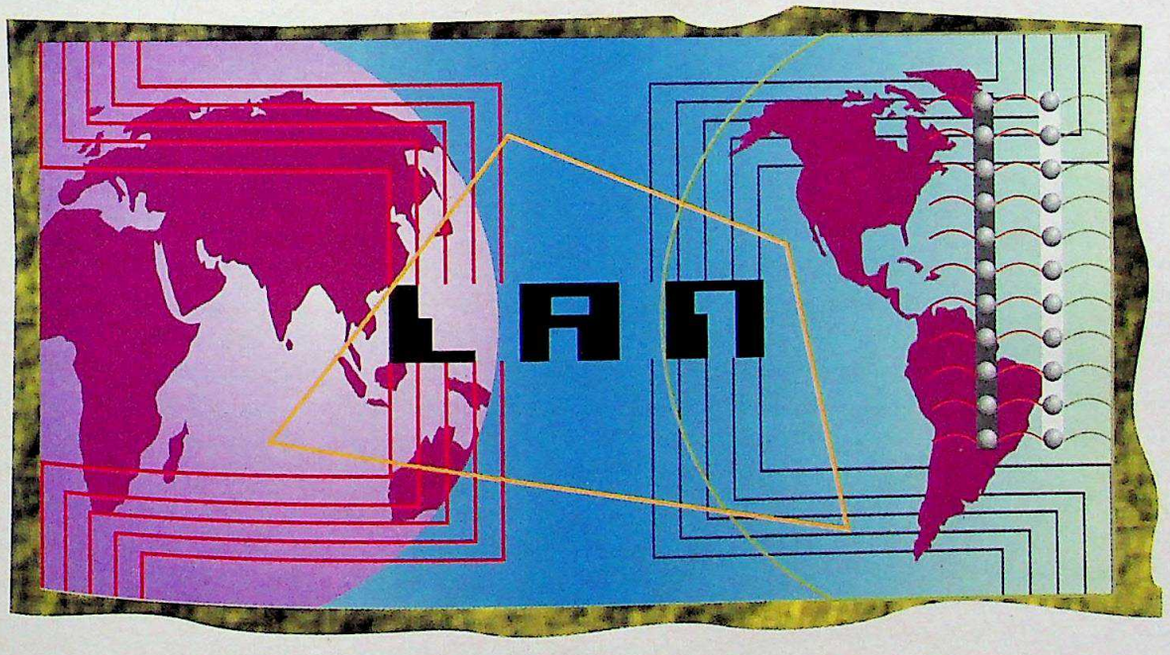
Okay, I broke the law. But I'm glad I did. □

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Share & Share A Lot

Whether you have ten people on a network or a hundred, sharing one or more printers over your LAN can save time and money. We review 11 models that range from 12 ppm to 40 ppm; one is perfect for you.



Next to the computer itself, a standalone laser printer is probably the most expensive component in an office system, yet it is probably the least used. The typical user prints only about a dozen pages of hard copy in an 8-hour day, which means that the $500 4-ppm personal laser on a user's desk sits idle for 7 hours and 57 minutes, more or less. It's no wonder that businesses opt to share printers among groups of users.

More and more printers can be found tethered to network connections these days. According to the Giga Information Group (formerly BIS Strategic Decisions), a Cambridge, Massachusetts-based market research firm, the market for network printers is robust. Sales of 13- to 25-page-per- minute (ppm) laser printers grew 60 percent last year, from 223,000 units in 1994 to 350,500 units in 1995. Unit sales for smaller networkable workgroup printers, in the 7- to 12-ppm range, held steady at about a million units for the period. The high-speed workhorses, in the 26- to 40-ppm range, accounted for about 5,000 to 6,000

By Alfred Poor

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HIGHLIGHTS

Hooking Up with a Network Printer

A few strategically placed shared network printers can save your organization a lot of money. But they can also cause headaches for the network administrator and end users if you don't choose one with the right features.

Some guidelines With a variety of print-engine speeds available, it is sometimes difficult to decide exactly what speed printer you should purchase. For small workgroups (a dozen people or fewer), a 12-ppm unit should suffice. Larger workgroups may need a 16-ppm to 20-ppm model. For more than two dozen users, consider a 24-ppm model. If you need a shared printer for an entire floor or for production-level work where you'll be producing multiple copies of many documents, consider a machine that offers 38-ppm printing or above. Also take into account the printer's rated monthly duty cycle. For large workgroups, at least a 50,000-page duty cycle is advised.

Share with your neighbor Shared printers are often placed in a central location and not on somebody's desk, meaning that they need to be able to run for long periods of time without attention. This translates to toner and other consumables that last a long time, lots of paper capacity (both input and output), and reliable performance that avoids paper jams and other malfunctions.

Sharing can be easy All it takes to add a printer to most networks is to simply plug in the network cable. Many printers come with a network interface as a standard feature, and most offer a wide range of network cards as options. A few printers even support multiple network interfaces at the same time. Also look for robust and easy-to-use remote-management software for both the administrator and end users.

units per year; Giga expects this segment to show significant growth.

REVIEW CRITERIA

For this roundup, we tested network laser printers aimed at business users. To qualify, a printer had to have at least a 12-ppm engine, a built-in, Ethernet-compatible network interface card, plus Windows 95 and PCL support; it also had to be shipping in volume by our test cutoff date (March 5, 1996). The printers had to be new models not previously reviewed in a *PC Magazine* feature roundup, though we invited back two past Editors' Choice honorees still on the market to see how they compare with the newer competition.

We received 11 printers from six companies: the Dataproducts Typhoon 40, rated at 40 ppm; the Hewlett-Packard LaserJet 5M (a recently released 12-ppm model), HP LaserJet 4MV (a 16-ppm past Editors' Choice winner), and HP LaserJet 5Si MX (24 ppm); the Lexmark Optra R+ and LXi+ (both 16 ppm); the Okidata OL 1200/PS (12 ppm); the QMS 2425Ex Print System (24 ppm) and QMS 3825 Print System (38 ppm); the Xerox DocuPrint 4517mp (17 ppm) and Xerox 4520mp (a 20-ppm printer that won an Editors' Choice last year).

New printers from Lexmark and Kyocera would have fit the criteria for this review but weren't available in time for testing. The Lexmark Optra N (about $4,500) is a 24-ppm, 600-dpi, ledger-capable unit meant to compete directly with HP's LaserJet 5Si MX. It has two standard 500-sheet input bins and PCL 5 and PostScript Level 2 support; options include a universal 2,000-sheet input hopper, a duplexer, and an envelope feeder. Kyocera Electronics offers its 18-ppm, 600-dpi FS-3600+, a letter- and legal-capable printer for large workgroups.

The range of laser printers that fall under the definition of "network printer" is wide. Many 8-ppm and 10-ppm units offer direct network connectivity as an option. And any printer that doesn't can be attached to your network via an external print server (about $400 to $600) from companies such as Hewlett-Packard, Digital Products , Pacific Data Products, and Lantronix . We didn't test color laser printers or personal lasers since we cover them in separate issues this fall.

A TALE OF TWO CATEGORIES

As you can see from the page-per-minute ratings, the reviewed printers fall into two distinct categories. The five smaller printers with engine speeds of less than 20 ppm are designed to handle the printing needs of a smaller group of workers (from 5 to 25). They tend to have smaller paper-handling capabilities (500 sheets of input or less), lower duty cycle ratings (less than 50,000 pages per month), and few paper-handling options.

The six larger printers are aimed at departmental installations, serving the print needs of several dozen individuals. Heavy-duty print engines are designed to handle large volumes of paper on a monthly basis and to churn those pages out at rates of 20 to a frenetic 40 pages per minute. These larger printers are more likely to offer more robust paper-handling options, such as large-capacity input and output bins (2,000 sheets or more).

MOST IMPORTANT: RELIABILITY

Through our discussions with network printer buyers and vendors, we found four attributes that are key for these machines: reliability, ease of use, print quality, and performance. Reliability placed so high because, unlike a personal printer that sits within arm's reach of a user, a shared printer is often placed in a central location, which means that it needs to be able to run for long periods without attention.

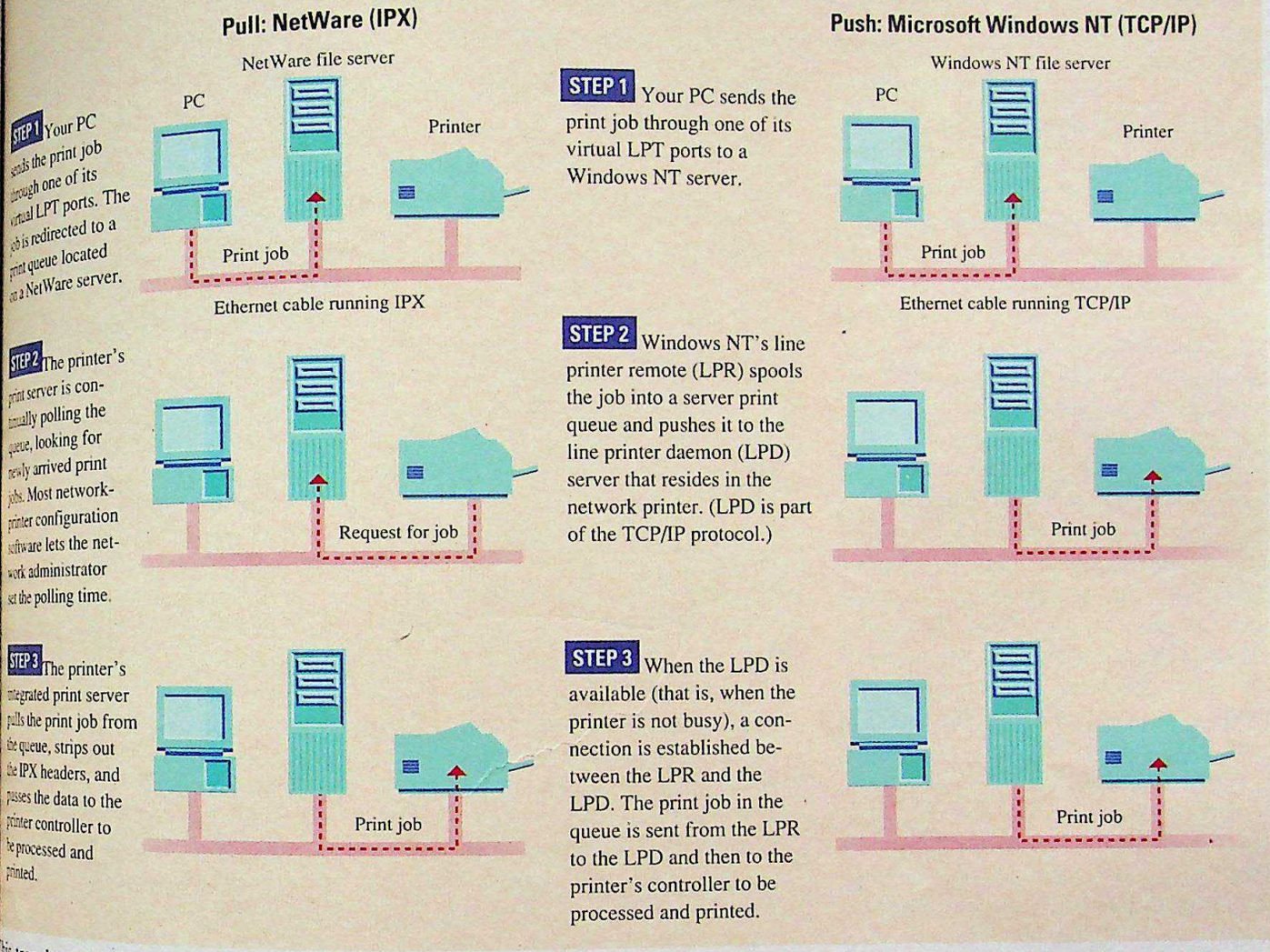
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Pull vs. Push:
Network Printing on NetWare and Windows NT



his translates to toner and other con-
nables that last a long time, lots of
per capacity, and reliable performance
t avoids paper jams and other mal-
ctions.

The second most important purchase
cision network printer buyers report is
se of use, both for the network adminis-
tors and the end users. On both ends,
twork printers have evolved signifi-
ntly. Today, manufacturers build net-
rk interface cards right into the print-
s themselves, so all it takes to add a
inter to most networks is to simply plug
the network cable. The majority of the
rinters in this review include a NIC as
tandard equipment, and all offer NICs as
ptions so you can choose the right inter-
ce for your type of network. In fact,
very printer in this roundup (except the
Dataproducts Typhoon 40) accepts multi-
ple network interfaces that let you connect one printer to two or more different physical networks.

On the software side, most of the printers we looked at have excellent programs that run under Windows or DOS, making it easy to configure the printer and establish the network connection. These let you create the required print queues on the network and other configuration tasks without having to use the network utilities such as NetWare's PCONSOLE. They also automatically alert the administrator (or other designated party) via the network if an error condition (toner low, paper out, paper jammed) should crop up.

The most notable of these utilities are HP's standard-setting JetAdmin (which, when coupled with the LaserJet 5Si MX, even alerts you when paper is running low), Lexmark's MarkVision, and QMS's CrownAdmin. Xerox's Document Services for Printing (DS/P) is also robust and full-featured, though the Windows 3.1 version we had to use for testing was not as easy or intuitive as the others.

Network administrators also want a printer to be easy to use for end users. HP, Lexmark, Okidata, QMS, and Xerox all provide drivers with intuitive Windows interfaces so that users can easily choose the print options they need (type of paper,

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Our Contributors: ALFRED POOR is a contributing editor of *PC Magazine*. PADRAIC BOYLE is also a contributing editor, and STEVEN C. M. CHEN and JAMES KARNEY are frequent contributors to *PC Magazine*. LAURA COX was the project leader, and JAMIE M. BSALES was the associate editor in charge of this story.

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resolution, and so on) for a particular print job. More importantly, they alert a user of the printer's status. The time to find out that the printer is jammed or out of paper is before you send off your print job, not when you rush down the hall to pick up the pages on the way to an important meeting.

THIRD CONCERN: PRINT QUALITY

Not too long ago, all laser output looked pretty much the same. Resolution was almost universally 300 dpi (dots per inch), which looked great for text documents, though graphics and halftones that were supposed to show a particular shade of gray actually showed areas of either lightly or heavily concentrated dots. Then resolution started creeping up—to 600 dpi, 800 dpi, and true 1,200 dpi (pioneered by Lexmark). Some of these resolutions were *interpolated;* that is, made to look like a higher resolution than the engine was actually creating thanks to software algorithms that would change the size, shape, or placement of the toner particles. At the higher resolutions, business charts and monochrome photos actually start to look good: You get up to 256 levels of gray, and the dots become barely visible.

In this roundup, only the workhorses intended for text-intensive, high-output applications—the Dataproducts Typhoon 40, QMS 3825, and Xerox 4520mp—have default resolutions of 300 dpi, with maximum resolutions of 400 dpi and 600 dpi, respectively. All the others print standard at 600 dpi minimum, though the Lexmark Optras and the QMS 2425Ex units we tested come with enough memory to deliver true 1,200-dpi output. There is a noticeable difference in graphics print quality as you move from 600 dpi to 1,200 dpi (see the output samples), though print speed slows notably.

Though you might think it would rank higher, performance actually falls fourth on the priority list for most corporate buyers. Since the printer is likely to be in a central location and not right next to the user, chances are a job will be out of the printer before a user can walk down the hall and pick it up. The key here is figuring out how many users will share a printer, how often they print, and how large those jobs will be: You want to ensure enough throughput overhead so that jobs won't get stacked up like 757s at O'Hare on Thanksgiving weekend. If you need to continually churn out long text documents or multiple copies of shorter documents, for example, you may need a production-level machine like the Typhoon or QMS 3825. For single copies of shorter jobs, other aspects (such as paper handling or maximum paper size) should play more of a role than deciding between 18-ppm and 24-ppm engine speed.

What will make more of a difference is how well a printer handles emulation switching. Much of a printer's time is taken up processing the jobs, a task made more time-consuming if the incoming jobs use varying fonts and keep switching between PCL and PostScript languages. While all the printers in this roundup could handle such toggling, the QMS 2425Ex was especially robust. QMS's Crown architecture is able to receive, compile, and process different documents

Small workgroup:

HP LaserJet 5M

Large workgroup:

HP LaserJet 5Si MX

QMS 2425Ex Print System

The four aspects of a network printer that matter most to business buyers are reliability, ease of setup and use, print quality, and performance.

All the models we tested are capable, and four stand out. If you need to share a letter- and legal-capable unit among a small- to medium-size workgroup, the best of breed is currently the new 12-ppm LaserJet 5M from Hewlett-Packard Co. It is affordable (about $1,750 street), easy to set up and operate thanks to HP's excellent JetAdmin and JetPrint software, and produces the best 600-dpi output we saw. It also features the new PCL 6 emulation, which HP claims works with the Windows' Graphic Device Interface to boost print speed and return application control to the user more quickly.

PC MAGAZINE EDITORS' CHOICE

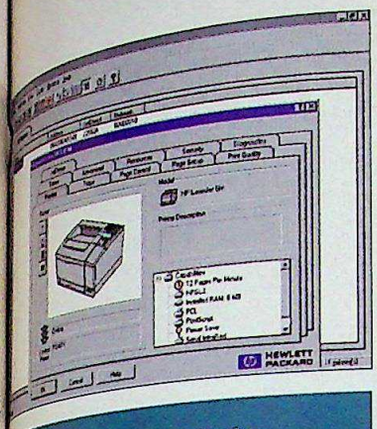
For larger workgroups, two 24-ppm printers in this group, the HP LaserJet 5Si MX ($4,899 list) and the QMS 2425Ex Print System ($5,499 list) merit our Editors' Choice. Both deliver flawless 600-dpi output on paper up to ledger size (11- by 17-inch); both also have a host of paper-handling options that you can tailor to any need and class-leading administration software. The 5Si MX distinguishes itself as the easiest network printer to configure and install. The QMS excels in multiprotocol, multi-emulation environments where its Crown architecture helps boost performance and cut down network traffic.

A fourth printer deserves an honorable mention. If you need ledger printing but not the speed of a 5Si MX, consider the LaserJet 4MV ($2,916 street). This 16-ppm unit offers fewer paper-handling options than its sibling but gives you unsurpassed HP software and print quality.

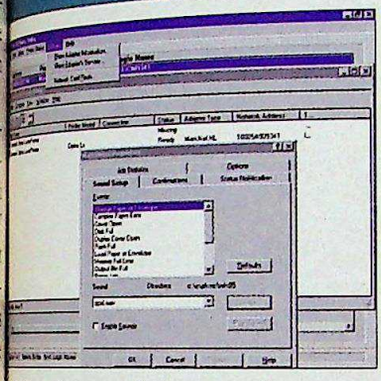
Finally, look closely at the strong points of the other players that might make them right for your needs. The innovative Xerox 4517mp, compact for a 17-ppm printer, offers an internal duplexer and a unique lockable "mail box" sorter that lets users keep their print jobs separate and private. If you need a super-duty printer, both the 38-ppm QMS 3825 ($22,000) and Dataproducts Typhoon 40 ($31,000) are worth a look. The QMS is easier to administer thanks to the company's CrownAdmin software; the Typhoon, built like a tank, is set up for you and is so economical that it could pay for itself in high-throughput environments.

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...itive, visual interfaces make the ...inistrative tools from Hewlett-Packard, ...xmark, and QMS a breeze.



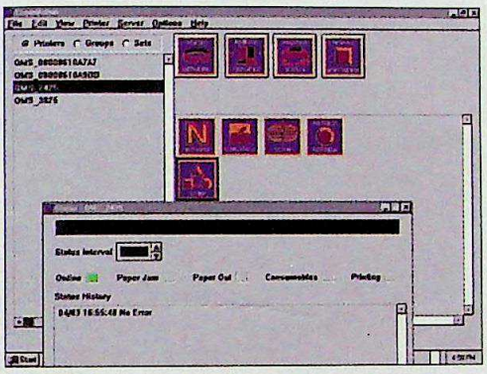
...different pages of the same document ...ile another page is being printed. Most ...nters process one page at a time. The ...xmark and Xerox printers, meanwhile, ...er a state-saving feature that lets you ...p often-used fonts and macros loaded ...RAM as the printer toggles to another ...ulation. This saves processing time ...en the printer needs to switch back.

...HER POINTS TO CONSIDER

...e price you pay up front for a printer is ...y a fraction of what it will cost you over ...s lifetime. The real hidden cost is con...mables. Manufacturer's calculate a rat...g of *cost per page* for their printers, ...ed on an industry-accepted norm of 5 ...rcent coverage for a page (a typical ...ge of double-spaced text). And here is ...re paying extra for a faster-rated ...nter with a higher duty cycle can pay ...idends. Because its toner and develop... components last longer, the economies ...scale push cost per page down for the ...P LaserJet 5Si MX and the QMS ...25Ex to about 1.7 cents per page, versus ...2 cents for most others. The QMS 3825 ...es even more money over time, setting ...k back just 1.2 cents for each printed ...ge. The Dataproducts Typhoon 40—the most expensive printer in this group, at around $31,000—can begin paying for itself within two years because its rated cost per page is a fraction of a penny.

Keep in mind that those cost-per-page figures don't include a huge money-eater: paper. You can cut your overall paper costs significantly just by having users print on both sides of that penny-a-sheet paper using the printer's automatic duplexer. The Typhoon 40 has a duplexer built in, and all but the HP LaserJet 4MV, Okidata OL 1200/PS, and Xerox 4520mp offer them as options for around $600.

Make certain that the printer you choose has sufficient flexibility to handle



the kind of print jobs you intend to create. If your office needs to print pages of the same document on different kinds of paper (the first page on letterhead, the rest on plain, for example), you'll want a printer that can accommodate several paper trays. Most of the printers in this review come standard with at least two input cassettes.

Another capability worth having on your network is ledger-size (also referred to as 11-by-17, B-size, or tabloid) printing for large spreadsheets or graphics. Because of the expense of the larger print engine required, 11-by-17 printing capability pushes the price of a printer up quickly. In this roundup, the Typhoon 40, HP LaserJets 4MV and 5Si MX, QMS 2425Ex, and Xerox 4520mp are ledger-capable.

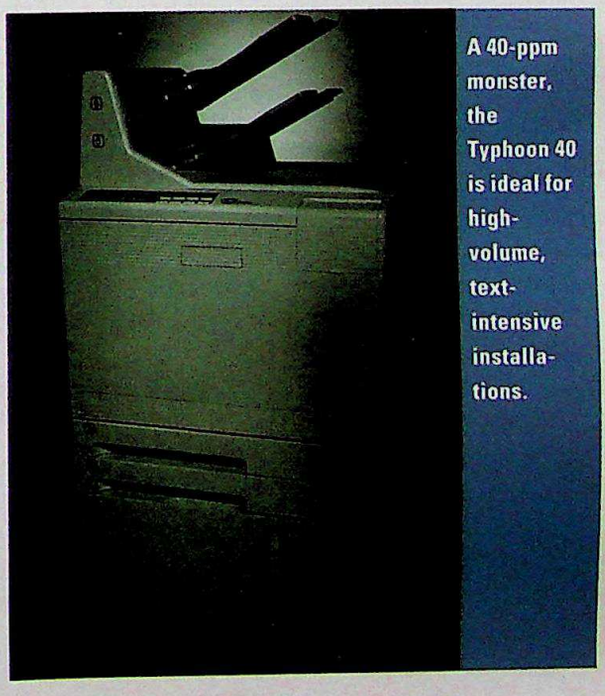
Beyond these basics, there are a range of options that make these printers more robust and convenient. Some offer sorting bins to keep jobs separated (the Xerox 4517mp has ten lockable "mailboxes"), hard disks to store fonts and forms and handle overflow jobs, and even automatic collators and staplers. In any case, the keys to creating a network printer that can work for you and your colleagues are reliability, flexibility, and ease of use.

Dataproducts Corp.

Typhoon 40

Production and service are the keywords that sum up Dataproducts' Typhoon 40. This 40-ppm laser printer is rated for 300,000 sheets per month, prints for just a fraction a cent per page, and has a host of features to maximize throughput. Don't worry about setting up this copier-sized beast: Its $31,420 price includes on-site installation and initial training for end-users and your network administrator. Note that the Typhoon 40 is best suited to high-volume, text-intensive environments. Offering just 400-dpi maximum resolution and outfitted with only Level 1 PostScript, its output quality (especially graphics) trails that of other lasers we looked at.

The Typhoon's basic configuration includes 24MB RAM (expandable to 32MB), an 80MB hard disk, a 1.44MB floppy disk drive for software updates, a 2,500-page paper hopper (with the ability to handle 11-by-17 paper), and duplexing. Dataproducts is planning to add PostScript Level 2 support and move to 600-dpi output in the near future. Network support includes Ethernet over 10Base5 operating IPX, EtherTalk, TCP/IP, or



A 40-ppm monster, the Typhoon 40 is ideal for high-volume, text-intensive installations.

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DEC LAT protocols.

While you can run the Typhoon with a direct connection to the server via its Centronics or serial ports, its real power lies in running virtual printers over a network. Dataproducts' PrintWatch remote management software lets the administrator configure up to 64 virtual definitions that appear as individual devices to end users. Each virtual printer can be configured to handle a certain type of job or use a set of features—printer language emulation mode, paper tray, duplex, margins and print areas, and so on. Because virtual printers are handled by the Typhoon 40's internal OS, the print server is treated as one device by NetWare.

PrintWatch is a thorough remote management tool. Once it is running on a workstation, an administrator can configure almost any feature without having to actually visit the Typhoon itself. PrintWatch has a set of screens with gas-gauge-style readouts that indicate when a printer is getting low on consumables or needs maintenance. You can track and generate a variety of information on a printer (or virtual printer's) condition and configuration. The software even tracks the number of pages (including duplex sides) printed by a user for accounting or management purposes. Our only complaint was the total reliance on PrintWatch for information; the Typhoon doesn't offer a status page that can be generated from the printer's control panel.

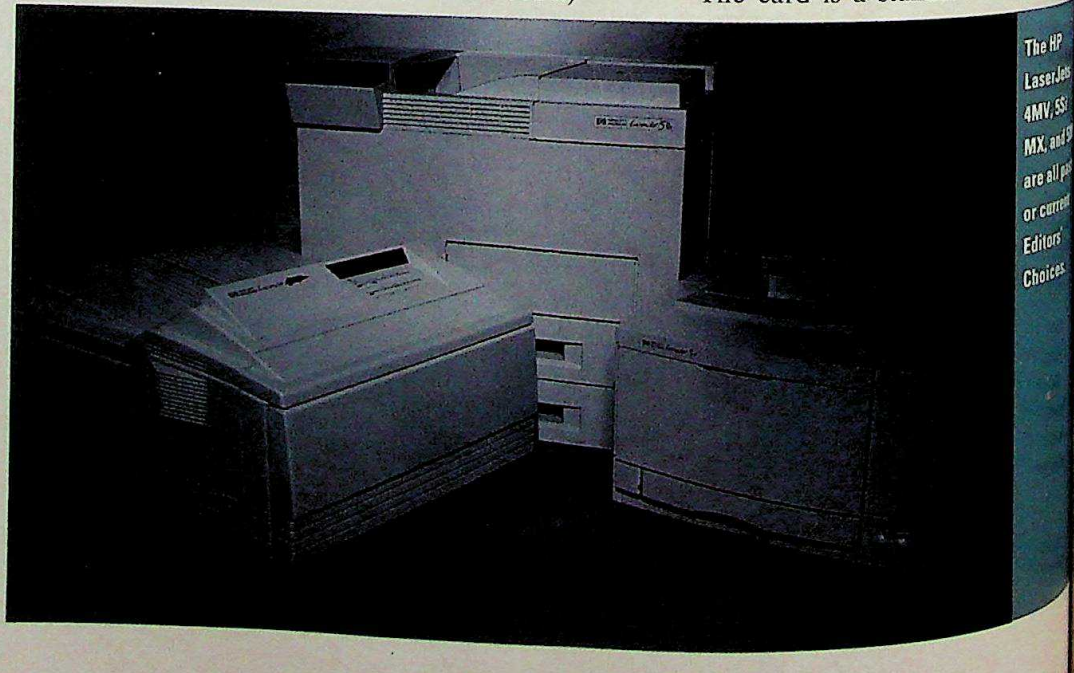
Several attributes set the Typhoon apart from the average departmental printer for handling heavy workloads. You can add toner and paper even while the unit is printing a job, and the unit has a self-clearing mechanism for paper jams. Since we could not even force a jam, we don't know how well it works. On most printers you have to discard the entire imaging drum when it reaches the end of its life, but with the Typhoon you simply replace the metal film that does the work. This helps keep printing costs down to 0.7 cents per page—the lowest we saw.

The Typhoon was consistently among the fastest printers on our battery of tests, though not far out in front as one might expect from a 40-ppm engine. Our test suite, which consists primarily of one- or two-page documents sent one at a time, is partly to blame. But on a more suitable test for this class, our 100-page Text and Graphics test document, the Typhoon (at 5 minutes 17 seconds) was tied with the 24-ppm HP LaserJet 5Si MX (at 5:16).

Dataproducts is planning to add spot color capability to the Typhoon 40, which can be retrofitted to existing printers. With the upgrade, the printer will be able to place two colors on a page: black and a second primary tone, which should be good enough for corporate logos and simple business graphics.

The Typhoon 40 is a workhorse that has the durability to survive in the most demanding production environments. If throughput, low printing costs, and minimal downtime are your primary needs (over high resolution or true PostScript), this printer should be high on the buy list.
—James Karney

Typhoon 40 is not available in India but Price of Typhoon 30S's is Rs 15,47,929.60 Dataproducts Corp., Simi Valley, CA;http://www.dpc.com.
(Indian partner Lipi Data, 1 Mittal Chambers, Nariman Point, Bombay 400021. Tel : 2026860, 2020757; Fax: 2873314.)



The HP LaserJet 4MV, 5Si MX, and 5 are all p or current Editors' Choices

Hewlett-Packard Co.

HP LaserJet 5M, HP LaserJet 4MV, HP LaserJet 5Si MX

PC MAGAZINE EDITORS' CHOICE

Hewlett-Packard, the d nant player in the laser p er arena, has three pri lines that meet the selec criteria for this review. the high end is the 24-p HP LaserJet 5Si MX ($ list), which defines the standard f large-capacity network printer. In middle is the HP LaserJet 4MV $3,549, street $2,916), a 16- ppm pri that was introduced almost two years a but still has a competitive positi Rounding them out is the new HP La Jet 5M ($2,229 list, $1,749 street), w has a 12-ppm speed and comes with a version of PCL.

The three printers have a numbe important features in common. All th have 600-dpi resolution with HP's Re lution Enhancement Technology (RE to smooth the jaggies on text and line In the HP laser-printer naming sche the "M" suffix indicates PostScript s port, and all three printers support b PCL and Adobe PostScript Level 2 (three printers come in PCL-only ba models for about $700 less.) All three include an HP JetDirect network int face card that supports both Ether (10Base-T and 10Base2) and LocalTa The card is a standard HP MIO ca

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SUMMARY OF FEATURES

Network Printers

Continues

	Dataproducts Typhoon 40	HP LaserJet 5M (PC MAGAZINE EDITORS' CHOICE)	HP LaserJet 4MV	HP LaserJet 5Si MX (PC MAGAZINE EDITORS' CHOICE)	Lexmark Optra R+	Lexmark Optra Lxi+	Okidata OL1200/PS
Rated engine speed	40 ppm	12 ppm	16 ppm	24 ppm	16 ppm	16 ppm	12 ppm
Street price, basic configuration	$31,420	$2,229	$3,549	$4,899	$1,749	$3,549	$1,839
Standard RAM/Tested-configuration RAM	24MB, 32MB	6MB, 6MB	12MB, 12MB	12MB, 12MB	2MB, 10MB	8MB, 8MB	6MB, 6MB
Memory enhancement technology	None	MEt	MEt	MEt	RAMSmart	RAMSmart	Adobe Memory Boost; Enhanced Memory Management
Best resolution/Highest noninterpolated resolution (dpi)	300, 400	600, 600	600, 600	600, 600	600, 1,200	600, 1,200	600, 600
Resolution enhancement technology	None	REt	REt	REt	PQET	PQET	OKI Smoothing
Printer-engine manufacturer	Hitachi Koki	Canon	Canon	Canon	Lexmark	Lexmark	OKI
Processor manufacturer and model	IDT 3081	Intel i80960 JF	Intel i80960 CF	AMD Am29040	AMD Am29030	AMD Am29030	MIPS R3000
Processor speed and type	33-MHz RISC	33-MHz RISC	33-MHz RISC	40-MHz RISC	25-MHz RISC	25-MHz RISC	32-MHz RISC
Highest PCL supported	PCL 5	PCL 6	PCL 5e	PCL 5e	PCL 5e	PCL 5e	PCL 5e
PostScript support	Level 1	Level 2	Level 2	Level 2	Level 2	Level 2	Level 2
PostScript author	PhoenixPage	Adobe	Adobe	Adobe	Lexmark	Lexmark	Adobe
Drivers and Software							
Windows 3.1/Windows 95/Windows NT	■■■	■■■	■■■	■■■	■■■	■■■	■■■
Windows 95 drivers	32-bit	16-bit	32-bit	16-bit	16-bit	16-bit	16-bit
OS/2 Warp	■	■	■	■	■	■	■
NetWare 3.12/NetWare 4.x/Windows NT 3.5 utilities	■■■	■■■	■■■	■■■	■■■	■■■	■■■
Remote printer-management software	PrintWatch	JetAdmin	JetAdmin	JetAdmin	MarkVision	MarkVision	OkiView
Requires NetWare's Pserver	■	■	■	■	■	■	■
Can control different brands of printers	■	■	■	■	■	■	■
Indicates printer on-line status/paper-size loaded	■■	■■	■■	■■	■■	■■	■■
Indicates paper jam/paper out/paper low	■■■	■■■	■■■	■■■	■■■	■■■	■■■
Indicates toner low/toner out	■■	■■	■■	■■	■■	■■	■■
Provides remote reset/printer-usage tracking	■■	■■	■■	■■	■■	■■	■■
Paper Handling							
Rated duty cycle (pages per month)	300,000	35,000	50,000	100,000	35,000	75,000	24,000
Number of standard paper cassettes/Total capacity	3/2,500	2/350	2/350	3/1,100	1/200	2/1,000	1/500
Prints on legal paper/tabloid paper/envelopes	■■■	■■■	■■■	■■■	■■■	■■■	■■■
Options:							
High-volume paper cassette capacity (and price)	Included	500 ($299)	500 ($449)	2,000 ($1,229)	None	None	500 ($299)
Duplexer/Sorter	Included/None	$699/None	None/None	$669/None	$639/None	$639/None	None/None
Mailbox/Stapler	None/None	None/None	None/None	$1,889/None	None/None	None/None	None/None
Rated toner cartridge life (pages at 5% coverage)	35,000	6,800	8,100	15,000	7,000	7,000	5,000
Estimated cost per page (at 5% coverage)	Less than 1 cent	2.3 cents	2.5 cents	1.7 cents	2 cents	2 cents	2.2 cents
Networking Support							
Standard/bidirectional/C-size parallel port	■■■	■■■	■■■	■■■	■■■	■■■	■■■
Other ports	■■	■■	■■	■■	■■	■■	■■
Supports simultaneously active ports	■■■	■■■	■■■	■■■	■■ Optional	■■ Optional	■■■
Supports more than one installed network adapter	■	■	■	■	■	■	■
Supports NetWare 4.x NDS	■	■	■	■	■	■	■
Type of Ethernet adapter	■	■	■	■	■	■	■
Type of Ethernet connector	$995	Included	Included	Included	$369	Included	$479
	10Base5	10Base-T, 10Base2	10Base-T, 10Base2	10Base-T, 10Base2	10Base-T, 10Base2	10Base-T, 10Base2	10Base-T, 10Base2
Card supports IPX-SPX/TCP-IP	■■	■■	■■	■■	■■	■■	■■
Card supports NetBIOS/NETBEUI/EtherTalk	■■■	■■■	■■■	■■■	■■■	■■■	■■■
Major protocols supported	DEC LAT	Sun OS, Unix	Sun OS, Unix	Sun OS, Unix	DLC, SNMP	DLC, SNMP	None
Networking adapter	Info not available	$619	$619	$619	$619	$619	$659
Hard-disk capacity (and price)	80MB (Included)	N/A	42MB ($499)	420MB ($499)	100MB ($799)	100MB ($799)	N/A
Web address (http://--------)	www.dpc.com	www.hp.com	www.hp.com	www.hp.com	www.lexmark.com	www.lexmark.com	www.okidata.com

Includes on-site installation.
N/A: Not applicable. The product does not have this feature.

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SUMMARY OF FEATURES

Ends

Network Printers

■ YES ■ NO	QMS 2425Ex Print System (PC MAGAZINE EDITORS' CHOICE)	QMS 3825 Print System	Xerox DocuPrint 4517mp	Xerox 4520mp
Rated engine speed	24 ppm	38 ppm	17 ppm	20 ppm
List price, basic configuration	$5,499	$21,999	$2,070	$4,070
Standard RAM/Tested-configuration RAM	24MB, 80MB	32MB, 32MB	6MB, 6MB	8MB, 12MB
Memory enhancement technology	None	None	Peerless MRT	None
Base resolution/Highest noninterpolated resolution (dpi)	600, 600	300, 600	600, 600	300, 600
Resolution enhancement technology	None	None	TruRes	TruRes
Printer-engine manufacturer	Canon	Ricoh	Fuji Xerox	Fuji Xerox
Processor manufacturer and model	NEC VR4300	IDT 3081E	Intel i80960	AMD Am29030
Processor speed and type	50-MHz RISC	40-MHz RISC	50-MHz RISC	25-MHz RISC
Highest PCL supported	PCL 5e	PCL 5e	PCL 5e	PCL 5e
PostScript support	Level 2	Level 2	Level 2 ($390 option)	Level 2
PostScript author	QMS	QMS	Adobe	Adobe
Drivers and Software				
Windows 3.1/Windows 95/Windows NT	■■■	■■■	■■■	■■■
Windows 95 drivers	32-bit	32-bit	16-bit	16-bit
OS/2 Warp	■	■	■	■
NetWare 3.12/NetWare 4.x/Windows NT 3.5 utilities	■■■	■■■	■■■	■■■
Remote printer-management software	CrownAdmin2	Crown Admin2	DS/P 2.0	DS/P 2.0
Requires NetWare's Pserver	■	■	■	■
Can control different brands of printers	■	■	■	■
Indicates printer on-line status/paper-size loaded	■■	■■	■■	■■
Indicates paper jam/paper out/paper low	■■■	■■■	■■■	■■■
Indicates toner low/toner out	■■	■■	■■	■■
Provides remote reset/printer-usage tracking	■■	■■	■■	■■
Paper Handling				
Rated duty cycle (pages per month)	100,000	200,000	50,000	75,000
Number of standard paper cassettes/Total capacity	2/1,000	2/500	2/350	3/750
Prints on legal paper/tabloid paper/envelopes	■■■	■■■	■■■	■■■
Options:				
High-volume paper cassette capacity (and price)	2,000 ($1,299)	2,500 ($5,495[2])	1,000 ($300)	1,500 ($560)
Duplexer/Sorter	$599/None	$5,495[2]/None	$445/$1,230	None/None
Mailbox/Stapler	None/$1,499	None/None	$1,230/None	None/None
Rated toner cartridge life (pages at 5% coverage)	15,000	30,000	10,000	14,000
Estimated cost per page (at 5% coverage)	1.7 cents	1.2 cents	2.1 cents	2.2 cents
Networking Support				
Standard/bidirectional/C-size parallel port	■■■	■■■	■■■	■■■
EPP/ECP	■■	■■	■■	■■
Serial/SCSI/LocalTalk port	Optional ■ Optional	■ Optional ■	■■ Optional	■■ Optional
Supports simultaneously active ports	■	■	■	■
Supports more than one installed network adapter	■	■	■	■
Supports NetWare 4.x NDS	■	■	■	■
Price of Ethernet adapter	Included	$799	$380	Included
Type of Ethernet connector	10Base-T	10Base-T	10Base-T, 10Base2	10Base-T
Card supports IPX-SPX/TCP-IP	■■	■■	■■	■■
Card supports NetBIOS/NETBEUI/EtherTalk	■■■	■■■	■■■	■■■
Major protocols supported	DEC LAT	DEC LAT	DEC LAT, SNMP	DEC LAT
Token-Ring adapter	$649	$899	$560	$560
Hard disk capacity (and price)	256MB (Included)	270MB (Included)	125MB ($485)	125MB ($475)
Web address (http://----------)	www.qms.com	www.qms.com	www.xerox.com	www.xerox.com

2 The high-capacity tray and duplexer are sold as a bundle.

which means that you can use a JetD... Token-Ring card instead if needed. (T... LaserJet 5Si MX has two MIO slots ... you can have two JetDirect cards insta... and simultaneously active if you choo...

The trio bundles a new version of H... standard-setting JetAdmin network ... ty software. This new version, 2.0, is e... and powerful; it lets you create and m... age print queues, name and configure ... printer remotely, and even choose wh... to notify when the unit needs attent...

End users can use the same softwar... monitor the printer's status. The net... administrator can set up password pro... tion to prevent users from changing ... printer configuration and can even lo... out changes at the printer's control p... The LaserJet reputation for quality a... ease of use is enhanced by this excell... network software; these were some of th... easiest printers to configure and run.

The workhorse of the three is the ... MX. Rated at 24 ppm, it has the hi... capacity paper handling needed to ke... up with this print engine speed: a pai... 500-sheet trays that can handle let... legal, or ledger stock, plus another ... sheet multipurpose tray. You can also a... a 2,000-sheet paper hopper ($1,299 fi... multibin mailbox unit ($1,889) that ... collate or separate jobs, and a duplex... ($669). This printer is designed for ... long haul. It is rated for up to 100,... pages per month and is built to be as in... pensive to operate as it is fast and relia... the rated per-page cost is just 1.7 cents... one of the lowest of the group.

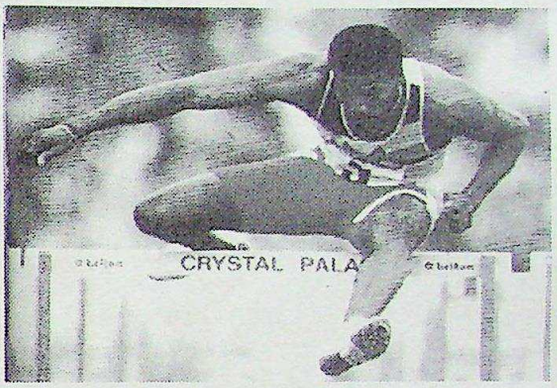
The 5Si MX was one of the fastest ... this review, outperforming even printe... with much faster rated engine speeds. ... also did well on our Emulation Switchi... and Protocol Switching tests, though w... one important caveat: On our test of ... multaneous TCP/IP and NetWare pr... ing, once a NetWare print job started ... queued NetWare jobs were printed b... fore the next TCP/IP job was started. T... was common to all three LaserJets. In ... mixed LAN environment with heavy N... Ware traffic, TCP users might wind ... waiting a while for their print job to s... face.

The 5Si MX has excellent print qua... Blacks are smooth and solid, and the ... hanced resolution yields beautiful, sm... text. Weak points included some ver...

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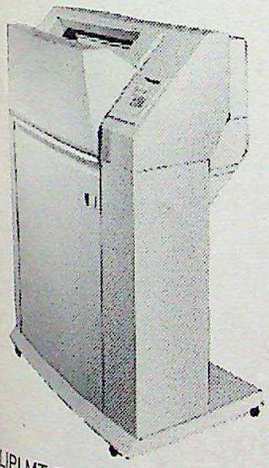
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NDPS: New NetWare Printing Architecture

When we revisit this feature next year, much of what we wrote about here should be obsolete, at least for businesses that migrate to the revision of NetWare due out this fall. Novell is working with most of the major network printer vendors to finish up NetWare Distributed Print Services (NDPS), a new architecture that will make setting up and using network printers and other shared devices a lot easier for administrators and end users.

Under NDPS, setup would be as simple as plugging the printer into the network and turning the power on. The device will be seen automatically by the network and be instantly usable to all network users. The administrator would not have to set up print queues to be accessed by users; also, drivers and subsequent driver updates would be automatically downloaded on the fly as needed. NDPS will also allow administrators to control all printers on the network from a single utility. At present, administrators with mixed-brand hardware have to launch each vendor's own admin utility to configure and control those printers. For their part, printer vendors will supply snap-in software modules for the NDPS utility that addresses the feature sets of particular printers.

For legacy printers without bidirectional communication capabilities, NDPS will have a database (borrowed from WordPerfect) of the functionality of 1,300 older printers, so the utility will be able to give users access to the appropriate features. HP, Xerox, and others should have NDPS gateways and modules on the heels of that. Eventually, Novell sees NDPS being embedded into printer controllers, which would allow users to print to any printer connected to any workstation connected to the Internet—a boon to service bureaus and branch-office operations that shuttle files via e-mail or removable cartridges.—*JMB*

banding on large gray-scale images. There was also a tendency toward posterization in continuous-tone images, especially with enhanced resolution enabled.

At 16 ppm, the 4MV (an Editors' Choice recipient for two years running) is not as fast as the 5Si MX, nor does it have large-capacity paper handling. It has a standard 250-sheet tray and a 100-sheet multipurpose tray; you can add an 500-sheet second tray ($449). The printer can handle 11-by-17 ledger sheets and is rated for 50,000 pages per month, with consumables costing 2.5 cents per page.

In terms of speed, the 4MV held its own against printers with much faster ratings. It was among the fastest overall on some tests, especially under PostScript. Print quality was similar to that of the 5Si MX, with excellent text and the same small flaws on large gray-scale images.

The newest HP LaserJet, the 5M, is rated at just 12 ppm and cannot handle 11-by-17 paper, but it costs about $1,300 less than the 16-ppm 4MV. It is designed to be shared by smaller groups. Like the 4MV, it has a single 250-sheet paper tray and a 100-sheet multipurpose tray, and you can add a 500-sheet second tray.

The 5M comes with PCL 6, which is designed to improve performance (see the sidebar "HP's PCL 6: The Next Step"). Despite this, the printer was generally a few ticks slower than the Okidata OL 1200/PS (the other 12-ppm printer we tested), though it was noticeably faster on the PostScript tests. Print quality, however, was superb. While the 5M's text quality was about the same as that of its siblings, its gray-scale images had much less banding and showed less posterization across continuous tones, especially with resolution enhancement disabled.

HP backs all three printers with one-year express-exchange warranties and free technical support.

All three HP LaserJet printers have their distinct advantages, and each has a place in your networked printer landscape.

All three of these printers have their advantages, and each has a place in your networked printer landscape. The adaptable, extensible 5Si MX can serve a large group of users and requires little attention. The 4MV still provides excellent speed and print quality for the money. And for distributed environments or small groups where budgets may be tight, the new 5M (or the non-PostScript $1,929 LaserJet 5) makes an excellent choice.—*Alfred Poor*

HP LaserJet 5M. Price: Rs 116,000; **HP LaserJet 4MV.** Price: Rs 188,700; **HP LaserJet 5Si MX.** Price: Rs 276,000. Hewlett-Packard Co., Santa Clara, CA; http://www.hp.com. *(Indian subsidiary Hewlett-Packard India, New Delhi; Indian partners CMS Bombay, ECIL, Hyderabad; Godrej Trading, Bombay; HCL-HP, Noida.)*

Lexmark International Inc.

Optra R+, Optra LXi+

Perhaps best known for its ground-breaking 1,200-dpi resolution, the Lexmark Optra family of printers delivers ease of use and solid printing performance as well as high-quality output. For this review we looked at the Optra R+ ($1,749 list, $1,400 street) and Optra LXi+ ($3,249 list, $3,000 street). Both are 16-ppm letter- and legal-capable units built around the same Lexmark engine and internals.

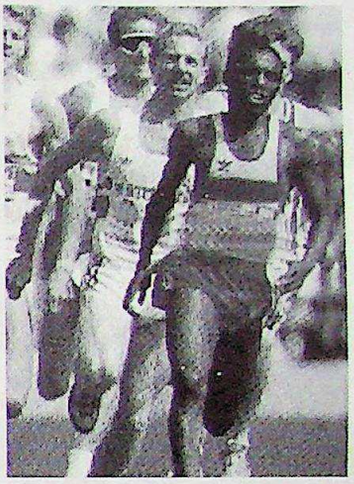
The Optra R+, with a 200-page standard paper capacity, is configured for small workgroups where print quality needs are high and money is tight. The larger LXi+ delivers a 2,000-page total input capacity, an internal Ethernet card (a $369 add-on with the R+), and 8MB of RAM standard and is meant for larger groups. Lexmark also offers the Optra Rt+ ($1,999), which is the same as the R+ but includes a second 200-sheet paper tray. The Optra Lx+ ($2,399) is a step down from the LXi+, with just 4MB of RAM, one 500-sheet paper tray, and no MarkVision Ethernet card.

Powered by a 25-MHz AMD 29030 RISC processor, both the R+ and LXi+ deliver PCL 5e and PostScript Level 2 emulation and true 1,200 dpi (actually able with a 4MB RAM upgrade on the R+). Lexmark's own resolution enhancement technology, PQET, sharpens output even in the default 600-dpi mode. Both models can take advantage of the same internal MarkNet network card, which is avail-

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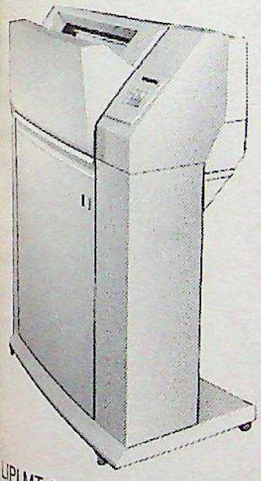
A taxing decathlon is a simple cake-walk for a champion



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* **Proven reliability :** Thousands of installations in India against only a handful of competition.
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* **Superior Paper Transport :** 4 tractors for reliable and fast paper movement. And bi-directional paper motion for printing graphics. Competition has only 2 tractors.
* **Multiple Interface :** Simultaneously active serial and parallel shared interfaces with auto-switching. Competition requires selection from the front panel.
* **Ethernet :** In-line ethernet interface for networking.
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for Token-Ring, LocalTalk, and Ethernet versions. The MarkNet XL multiprotocol support can handle just about all of the popular network operating systems.

Setting up both the Optra R+ and LXi+ is straightforward. Inside you will find two available expansion connectors to accommodate up to two internal network interface cards, or you can use one of the connectors for a 100MB hard disk. A flash memory module is also available for storing macros, forms, and fonts. The all-in-one toner cartridge is available in either a 7,000- or 14,000-page capacity. Lexmark also offers a duplexer ($639); a sorter is planned for an upcoming model, the Optra N.

The Optra models also feature a 20-character, four-line LCD. An easy-to-understand menu and simple push-button operation make them some of the easiest network printers to set up.

The fine MarkVision printer utility for Windows 3.1 can be used for configuring the print server and creating a print queue in NetWare. It also supports monitoring capabilities over the network.

On our troubleshooting tests, the utility was able to give us an accurate indication of all the problems we created, and the MarkVision operator panel window (which duplicates the printer's control panel) gave us an almost instant report of these problems. The operator panel allows full access to the control panel, so you can take the necessary action from your desktop. The only feature the MarkVision lacks is the ability to view and manipulate print jobs in the print queue.

Lexmark has updated its printer drivers and the MarkVision network printer utility for Windows 95, though we still see room for improvement. The installation program for the printer drivers and the utility needs to be streamlined, and the Windows 95 version of the utility is not end-user–accessible. So in a NetWare environment, you must have administrator access to use the utility. Both of these shortcomings will be addressed in a future release. Until then, you can rely on the Windows 3.1 version of the utility (which, incidentally, also runs faster).

Configuring the Lexmark for TCP/IP protocol and printing from Windows NT Server was painless. No printing problems occurred during our testing, and the units passed both the emulation- and protocol-switching tests with flying colors. We were able to install the second NIC and configure it as smoothly as the first NIC in both the Optra R+ and LXi+.

Both printers produced similar results on our performance tests—not surprising, considering that both are equipped with the same engine and processor. Throughput is not quite as speedy



Lexmark's Optra LXi+ and Optra R+ units offer true 1,200-dpi printing.

HP's PCL 6: The Next Step

The original Hewlett-Packard LaserJet was introduced 12 years ago, and it made PCL a familiar term for microcomputer printers. That printer used HP's PCL 3, and the company developed PCL 4 and PCL 5 for subsequent printers in response to user demands for more features. The latest model in the line, the LaserJet 5M series, introduces the newest version of the printer language: PCL 6. PCL stands for Printer Control Language; it was actually introduced in PCL 1 and PCL 2 versions in HP ink jet and dot matrix printers before the first LaserJet. Features such as downloadable fonts, form overlays, scalable fonts, and bitmap image compression are part of the PCL command set, so that it rivals PostScript in terms of flexibility and power.

The brand-new PCL 6 extends this printer language even further. New commands match Microsoft Windows' Graphics Device Interface (GDI) more closely, so print drivers can translate a document into PCL faster. This means that users will regain control of the system sooner.

The commands are object-oriented and smaller, which shrinks the size of the print data stream, which in turn puts less of a load on networks and means faster transfer times for stand-alone systems. And a new font-synthesis technology is intended to make the printed output a more accurate representation of what you see on the screen.

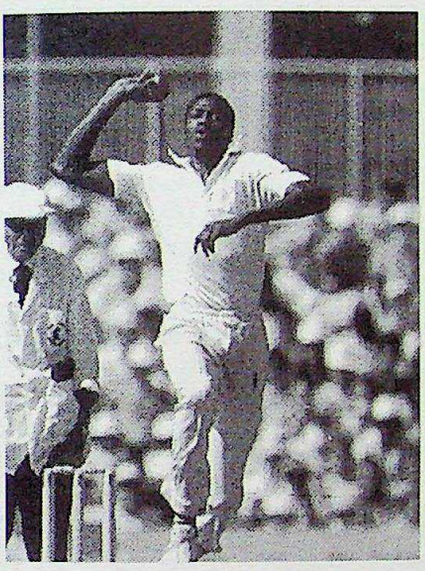
PCL 6 has a modular architecture that will make it easier to add extensions: for example, there are efforts under way to improve print quality of World Wide Web documents. On the other hand, it is backward-compatible with all prior versions of the printer language.

The HP LaserJets 5N and 5M are just the first LaserJets to use PCL 6; you can expect to see it as part of future HP LaserJets, as well as on printers from other vendors.—*AP*

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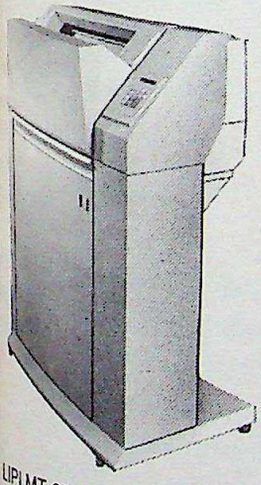
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BENCHMARK TESTS

Network Printers

PC MAGAZINE LABS

On our application tests, a vendor's implementation of the emulation language (PCL or PostScript) was just as important to performance as rated engine speed. Some printers switched between the two emulations without a hiccup; others slowed considerably.

What the Numbers Mean

The 10-page Microsoft Word for Windows 7.0 test, which we ran using each printer's PCL emulation, shows that the 24-ppm HP LaserJet 5Si MX and the QMS 2425Ex Print System set for 600-dpi resolution are as quick as the two faster-rated units (the 38-ppm QMS 3825 Print System and 40-ppm Dataproducts Typhoon 40) set for 300 dpi. The mere size of the QMS 3825 and Typhoon 40 may account for their slower-than-expected performance on this test, since the paper has a longer path to follow through the printer and the time for the first page out is substantial. Although the 20-ppm Xerox 4520mp performed more on a par with the 16- and 17-ppm printers (except for the 17-ppm Xerox DocuPrint 4517, which came in behind them), keep in mind that the Xerox units are penalized by 10 seconds because their polling rate is fixed on the hardware.

The only surprise on our 10-page Microsoft Word for Windows text and graphics tests was the performance of the 20-ppm Xerox 4520mp, which uses a Fuji-Xerox XP-20 engine and a 25-MHz AMD 29030 processor. It printed approximately 30 seconds slower than the newer (and slower-rated) Xerox 4517mp, which uses a Fuji-Xerox ASAMA engine and a 50-MHz Intel i960 processor. The fact that the Xerox 4517mp has a newer engine that runs internally at double the clock speed can account for increased speed. The Xerox 4520mp was also outrun by the two 12-ppm printers: the HP LaserJet 5M (which uses a Canon engine and an Intel RISC 80960JF 33-MHz processor) and the Okidata OL 1200/PS (OKI engine with a MIPS R3000 RISC 32-MHz processor). The Xerox 4520mp seems to perform poorly when printing graphics, as indicated on other graphics-intensive tests, such as the **Lotus 1-2-3 for Windows** test, where it trailed the field.

The Tougher Tests The HP LaserJet 5Si MX was the overall winner on our 100-page Microsoft Word for Windows text and graphics tests in PCL mode, beating even the Dataproducts Typhoon 40 (though just by a single timer tick). The 5Si MX doesn't have to emulate PCL, which contributed to its fine showing. The Xerox 4517mp, which uses specialized PCL drivers, also did extremely well, beating not only the 20-ppm Xerox 4520mp but also the 24-ppm QMS 2425Ex. The file generated with the Xerox 4517mp driver is three times as large as the one generated by the QMS 2425Ex (which uses the HP 4Si driver), and it is probable that the overhead involved in receiving and decompressing the file is a factor in the QMS 2425Ex's performance. Since the QMS 2425Ex is equipped with a standard hard disk capable of virtual swapping, we tried turning it off for this test to ensure that the print job wasn't being swapped to disk. The QMS 2425Ex paused when printing the first 20 pages of the document (which is where the most graphics-intensive content exists), then went full-speed ahead.

The three 16-ppm printers (HP LaserJet 4MV, Lexmark Optra LXi+, and Lexmark Optra R+) all printed this 100-page document at relatively the same speed. The HP 5M, a 12-ppm printer that uses a Canon engine and Intel 80960JF 33-MHz processor, prints almost 2 minutes faster than the 12-ppm Okidata. Both machines have 6MB of memory installed. The HP 5M uses specific drivers and supports the new PCL 6, while the Okidata 1200/PS recommends an HP4 driver using PCL 5e.

On the PostScript version of this test, the two 24-ppm printers won the top scores. The QMS 2425Ex actually printed this document faster with its PostScript driver and, in fact, was the only printer whose PostScript driver outperformed its PCL counterpart

All test scores are in minutes:seconds.

Rated speed		Microsoft Word for Windows Text (PCL)	Microsoft Word for Windows Text and Graphics (PCL)	Lotus 1-2-3 for Windows (PCL)	CorelDraw for Windows (PostScript)
12 ppm	HP LaserJet 5M	1:05	1:07	0:31	0:47
12 ppm	Okidata OL 1200\PS	0:59	1:08	0:25	0:53
16 ppm	HP LaserJet 4MV	0:52	0:57	0:24	0:35
16 ppm	Lexmark Optra R+	0:58	1:00	0:26	0:45
16 ppm	Lexmark Optra Lxi+	0:55	1:01	0:27	0:44
17 ppm	Xerox 4517*	1:01	1:00	0:31	0:55
20 ppm	Xerox 4520mp*	0:56	1:30	0:39	0:57
24 ppm	HP LaserJet 5Si MX	0:39	0:46	0:22	0:40
24 ppm	QMS 2425Ex	0:40	0:49	0:23	0:30
38 ppm	QMS 3825	0:43	0:43	0:33	0:38
40 ppm	Dataproducts Typhoon 40	0:36	0:42	0:24	0:32

* Results include Xerox's default network polling time of 7 to 10 seconds, which under NetWare 3.1 could not be changed to the 2-second time we used for the other printers.

◀BETTER

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this test. QMS uses its own version of PostScript, and the compa- may have optimized certain interpreter functions to be more ficient in their architecture (making them work better with both Crown operating system and the processor). The Dataproducts phoon 40, which prints slower than the three 16-ppm printers, s a PostScript Level 1 interpreter that isn't capable of handling mpressed image data.

On our **Multiple Print Jobs** test, the Typhoon 40 was the overall nner, but only by a small margin. The four fastest-rated printers Typhoon 40, HP 5Si MX, QMS 3825, and QMS 2425Ex) all com- ted the test in less than 40 seconds. The Xerox 4520mp did well this test since the files were small and contained no graphics. All achines handled the multiple print job fairly well, with no delays tween jobs.

For the **Emulation Switching** test, we interleaved our 10-page text graphics Word document and our 1-page Corel PostScript cument. Each document was printed three times (for a total of documents). This is where the two QMS printers really shone. The QMS 2425Ex completed the test in almost half the time as the competing HP 5Si MX. We attribute this difference at least partly the ability of the QMS Crown architecture to receive, compile, d process different documents or different pages of the same document while another page is being printed. Most printers process one page at a time.

The two Lexmark printers also performed well. The Lexmark Optra family of printers uses a single set of object-oriented func- ons (jointly developed by Lexmark and IBM) that support graph- s functions for PostScript Level 2 and PCL 5e. Lexmark's graphics ftware calls on page-map code, which has knowledge of the ternal format of bitmaps and allows both PCL and PostScript mulators to use a unified graphics package. One of the benefits of his design is a *state-sa ing option,* which keeps the emulator from restarting when the printer is switched to another emulation. With state saving on, the resources from each emulation are maintained, and there are no delays between different print job emulations.

The manner in which a printer determines a PCL job from a PostScript job usually involves an algorithm that scans a small portion of the data stream for identifiable PCL and PostScript codes. You then set the printer up to auto-sense print jobs as opposed to specifying a specific emulation. In the Windows environment, printers such as these HP LaserJets and the two Xerox units have drivers and interpreters that support the creation of PJL commands for switching emulations.

PJL, a language invented by Hewlett-Packard, handles functions outside the realm of PCL such as printer status functions. A Windows driver that issues a PJL emulation switch command provides a bulletproof way of switching emulations. Vendors such as QMS will support PJL in the future. The Dataproducts printer requires setting up separate virtual printers with separate queues for each emulation to ensure proper switching.

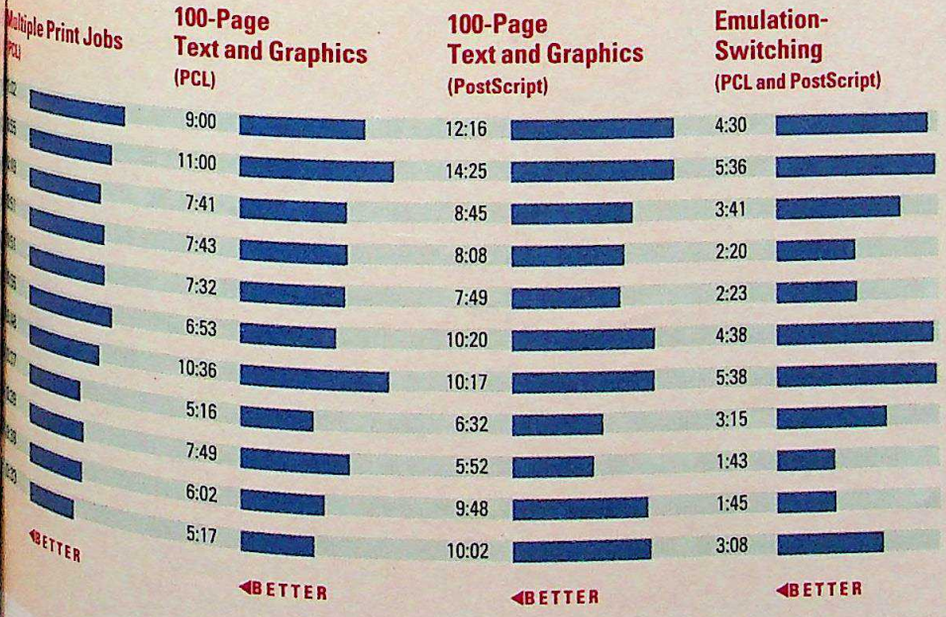
Delays between jobs were noticeable in the two Xerox printers. Although both Xerox printers have a state-saving feature like the Lexmarks', the tested configurations lacked the RAM (about 20MB) required to enable it. The recommended amount of memory for state saving in both PCL and PostScript mode is 20MB for the Xerox 4520mp (tested with 12MB RAM) and 22MB for the Xerox 4517mp (tested with 6MB RAM).

We also ran each printer through a **Protocol Switching** test to determine if it could handle interleaved print jobs coming from two different types of networks. Switching protocols required that each print server be issued a TCP/IP address that matched our isolated test setup. Some printer utility software, such as HP's JetAdmin, allowed us to easily set the print server's TCP/IP address through software. Others, like Xerox, required an "arp" command to be issued from the Windows NT server. We used Windows NT TCP/IP print services using LPR/LPD (Line Printer Remote/Line Printer Daemon). If a vendor didn't supply us with a specific NT driver, we used the driver in Windows NT that most closely matched the printer.

All printers were successful at switching between the IPX and TCP/IP protocols. On our tests, we found that the Typhoon 40 favored the IP protocol but still allowed IPX jobs to print between IP jobs. Although the Okidata OL 1200/PS was able to switch protocols with Rev H of their print server card (Rev B didn't have that capability), we were confronted with port time-out settings, which caused delays in TCP/IP printing.

The Lexmark, QMS, and Xerox printers all successfully interleaved IPX jobs with IP jobs. The HP LaserJet printers, using HP's JetDirect cards, were not successful in interleaving IPX jobs with IP jobs. HP confirms that the JetDirect cards service the NetWare queue until all jobs are printed (a delay mechanism built into the JetDirect card is not settable). Since HP sells largely to the NetWare community, it consciously made the decision to service the entire NetWare queue. HP also claims that most printing scenarios will not present multiple IP and IPX jobs to the printer concurrently.

During our testing, while the HP JetDirect print servers were servicing our IPX jobs, the NT server was attempting to print jobs every 2 seconds, only to find the printer busy. We tried using the LPR/LPD TCP/IP printing protocol as well as DLC, the latter suggested by HP documentation. We



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BENCHMARK TESTS

also tried numerous polling times on the JetDirect cards. All HPs serviced the IPX jobs in a batch and let the IP jobs through when the queue was completely empty.

How We Tested

All speed tests were conducted on a NetWare 3.12 network. A specific queue was set up for each printer, and the print server was set to poll the NetWare queue every 2 seconds (except for the Xerox units, which had a default setting of 10 seconds).

We spooled each print job RAW to the printer as opposed to using Windows 95 EMF spooling, which allows for quicker return to application time in some non-PostScript printers. PC Magazine Labs did perform tests to determine the diffference between RAW and EMF and found that it makes little difference when printing small jobs. We felt that RAW print streams would allow for a fairer comparison among the different printers—especially since vendors such as HP did not provide EMF support. Except for setting the drivers with the proper memory setting, we tested each printer with its default settings.

The **Microsoft Word for Windows** 7.0 short test measures a printer's speed in producing a 10-page report that incorporates multiple fonts and type faces, as well as five small bitmapped graphics images.

The **Microsoft Word for Windows** 7.0 long test measures a printer's speed in producing a 100-page report that uses multiple fonts, typefaces, line art, and gray-scale images. This test was run with both PCL and PostScript drivers.

The **Lotus 1-2-3 for Windows** test measures a printer's speed in producing a 3-page spreadsheet that contains pie, bar, and radar charts.

The **CorelDraw 6** test measures a printer's speed in producing a 1-page document that contains a gray-scale texture map that encompasses the entire page, as well as text that was converted to curves.

For the **Emulation Switching** test, we printed the 10-page Microsoft Word document interleaved with the 1-page CorelDraw document. Each printer was taken off-line until six jobs were lined up and interleaved in the NetWare queue.

For the **Protocol Switching** test, we used text-only documents. Three IP jobs were sent to an NT server, and three IPX jobs were sent to a NetWare queue. Once jobs were lined up in the queues, we turned the printer online and started the timer. For the Multiple Document test, we printed five 2-page text documents. Each printer was taken off-line until a total of five jobs were lined up.

The Test-Beds Each test-bed consisted of four 90-MHz HP Vectra/XU systems with 16MB of RAM and a Quantum 1.2 GB hard disk. Two client machines were set up with Windows 95. Two Ethernet servers were also set up: NetWare 3.12 running IPX and Windows NT 3.5.1 running TCP/IP. We also set up LANalyser 2.1 on a 486/66 to help analyze and troubleshoot problems. Each test-bed ran on its own isolated network using Asanté 10Base-T hubs.

The network printers in this roundup range from 12 ppm to 4 ppm. Individual reviews describe printer administration and departmental/workgroup printing features.

as that of others in this ppm category, though by just a few seconds. Print quality, meanwhile, is excellent at 600 dpi and, at 1,200 dpi, exceptional. Text is razor-sharp, and halftone images show smooth transitions from highlights to shadows. Printing in 1,200-dpi mode is about 25 percent slower than 600-dpi mode, but it can be justified when you need the highest quality output.—*Steven C. M. Chen*

Lexmark Optra R+. Price: Rs 136,000+taxes; **Lexmark Optra LXi+.** Price: Rs 230,000+taxes. Lexmark International Inc., Greenwich, CT; http://www.lexmark.com.
(Indian partners Alphabetics, New Delhi; TVSE, Bombay.)

Okidata

Okidata OL 1200/PS

The Okidata OL 1200/PS is a simple, affordable (with the network card, $1,839 list) printer intended for small workgroups. Don't expect it to give you fancy remote management or high-volume output, but count on good-looking 600-dpi graphics (interpolated to 1,200-dpi) and excellent PostScript capability. The unit's design gives precedence to output quality over network features.

This printer uses an LED engine rather than a true laser, but output quality is identical. It comes standard with 6MB of RAM (expandable to 34MB), Adobe PostScript Level 2 support, and PCL 5e emulation. You may want to add the optional $479 Ethernet or $659 Token-Ring cards; there are no provisions for a hard disk or multiple network cards.

The OL 1200/PS's basic paper capacity, duty cycle, and management tools are adequate for a small- to medium-sized workgroup. Its small footprint (14.4 by 16.9 by 10.6 inches) saves desk space but limits paper-handling options.

Unfortunately the OL 1200/PS cannot handle 11-by-17 paper. The unit's standard paper tray, accessed as a pull-out drawer on the bottom front of the printer, holds 500 sheets. You can configure the machine with a 500-sheet tray ($299) and a 100-sheet/50-envelope feeder ($169). The unit's toner cartridge is rated at 5,000 pages with 5 percent coverage—the same as that of most desktop printers—and the image drum's life expectancy is 30,000 sheets.

We had no problems configuring the printer either to handle IPX operation under NetWare's PCONSOLE or to use TCP/IP under Windows NT. Installing the network card requires only a screwdriver. Hardware setup is handled via the menus on the control panel, which are adequate for accessing the printer's features. The manuals explain the basics but could be a bit more thorough on the benefits of the different options.

Remote-control management is limited to that provided by the network operating system and a sensor on the printer that can broadcast a message to users when the printer is out of paper. It's a far cry from the full-blown JetAdmin software that Hewlett-Packard delivers with its competing LaserJet 5M, but the Okidata's controls are adequate.

Suited for graphics users who don't need 11-by-17 output, this printer delivers enhancements that make working with complex pages and bitmaps more elegant. The OL 1200/PS comes with Adobe's Memory Booster Technology and Okidata's Object Smoothing Technology. The memory booster speeds up the printing of graphics and other difficult images. The image-smoothing technology boosts the perceived

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Okidata's OL 1200/PS model is a competent printer for small workgroups.

solution to 1,200 dpi. On our samples, it ...ceably improved gray-scale prints and ...duced tonal banding compared with what ...e basic settings produced.

Throughput speed was competitive with ...at of the 12-ppm HP LaserJet 5M. The ...L1200/PS handled our Protocol Switch-...g test once we installed the proper inter-...ce card (labeled Rev. H). The cost per ...ge, at 2.2 cents, is also in line with that of ...e competition.

If you need high-quality graphics out-...t in a moderate-duty, small workgroup ...vironment, consider the Okidata OL ...00/PS—*JK*

...kidata OL1200/PS. List price (with Ether-...t adapter): $1,839. Okidata, Mount ...aurel, NJ; http://www.okidata.com.

...dian partner TVSE, Bombay.)

...MS Inc.

...MS 2425Ex Print System, ...MS 3825 Print System

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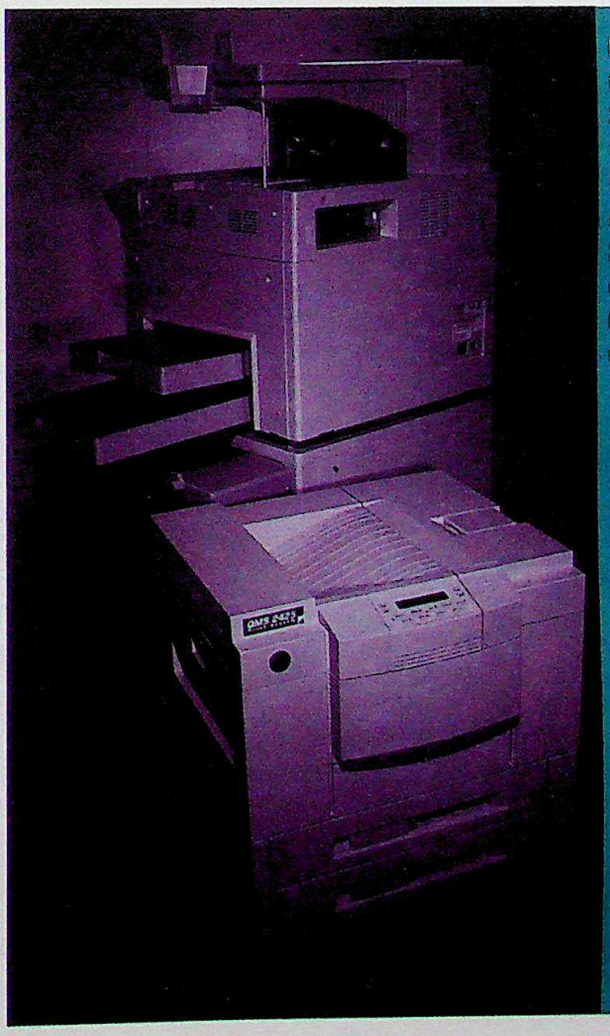
QMS's brand-new QMS 2425Ex Print System printer ($6,999 list price), with its 24-ppm engine, 600-dpi output, robust paper handling, and excellent CrownAdmin2 administration software, presents some stiff competition to the dominant departmental laser in this arena, the HP LaserJet 5Si MX.

For this review, we also requested QMS's 38-ppm workhorse, the QMS 3825 Print System ($21,999 list), to see how it stacks up against the production-level Crimson 40 from Dataproducts. Both printers are designed around QMS's Crown multitasking software, which provides the intelligence that the printer needs for simultaneous operations, auto-switching emulation support, and other printing features such as usage tracking (for billing or resource allocation). To communicate with the LAN, our test units came with QMS's CrownNet mutiprotocol network interface card (standard on the 2425Ex; a $799 option with the 3825), which supports EtherTalk, LAN Manager, NetWare, OS/2 LAN Server, and TCP/IP protocols. This optional interface is also available for Token-Ring and DECnet networks.

Automatic emulation-switching support is accomplished via QMS's Emulation Sensing Processor (ESP) technology. ESP examines the incoming print job and automatically selects and processes the job with its native command language, which QMS claims boosts printer performance. A boost for multiple-copy print jobs comes from QMS's Display List feature. Other printers will need to process a large print job several times to produce several copies, but the Display List (and QMS's generous RAM configurations) let these printers store and print a job from memory. This not only produces jobs faster (especially for processor-intensive graphics files) but also cuts down on network traffic.

QMS provides one internal hard disk that is used for storing fonts, emulations, and other print features. Print jobs are spooled in RAM (24MB standard on the 2425Ex, 32MB on the 3825) as they enter the printer. In the unlikely event that the print job is too large to fit into RAM, both printers allow you to configure the printer to direct the overflow onto the internal hard disk. You can attach up to three hard disks to the 2425Ex and up to six to the 3825. Another nice touch: Both printers offer an automatic jam recovery feature that reprints pages lost during a jam.

The 2425Ex has a Canon P550 engine and a fast 64-bit NEC VR4300 processor operating at 50 MHz. Standard output resolution is 600 dpi (plus edge smoothing), and that can be pushed to 1,200 dpi with QMS's MultiRes daughtercard ($499). Two 500-sheet input cartridges are standard, and a 2,000-sheet input deck is available for $1,299. Capable of printing on paper ranging from postcard size to ledger (11-by-17), the 2425Ex also offers a $599 envelope feeder that can hold up to 100 envelopes, an option not found on the 3825.



Make room for the QMS 3825 (rear): It's extra big. The newer QMS 2425Ex earns an Editors' Choice.

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Other options include a duplexer ($599), combination sorter and stapler ($1,499), and even a copy station. The CrownCopy 300-dpi flatbed scanner ($1,999) connects via the 2425Ex's SCSI 2 port and can handle bound books or up to 50 sheets of paper with the automatic document feeder.

Our 2425Ex test configuration came with the standard 256MB internal hard disk, 80MB of RAM (the highest of any printer we reviewed here) and the Multi-Res board. To set up the 2425Ex, you need to consult the manual because several parts are not installed in the unit for shipping purposes, but setup is relatively simple. Moreover, QMS's CrownAdmin2 software is on a par with the best management utilities. You can easily configure and control printers remotely, and the software alerts you to the full range of error conditions. Even better, CrownAdmin2 provides a common interface across Windows 3.11, Windows 95, Windows NT and Unix platforms.

On a par with the best management utilities, QMS's CrownAdmin2 software lets you control printers remotely.

On our performance tests, the 2425Ex was consistently a few stopwatch clicks behind the HP LaserJet 5Si MX on PCL-mode tests, but it bested the HP in PostScript-mode contests. QMS explains that the 2425Ex uses HP's older PCL driver for PCL mode but uses QMS's own PostScript driver, which is optimized for the printer, when it prints in PostScript mode. On the Emulation Switching test, which interleaves three PCL-mode and three PostScript-mode jobs, the 2425Ex had a clear advantage, printing all the jobs in just 1 minute 43 seconds compared with the HP's time of 3:15.

The 3825 Print System is a larger beast, capable of churning out 200,000 pages per month from its standard twin 500-sheet bins or optional 2,500-sheet hopper ($5,499 with duplexer). Using a 40-MHz AMD 29040 processor, the 3825 can print sheets up to 11-by-17 collated or duplexed at up to 600 dpi.

The combination of the 150-pound 3825 and the massive paper-handling option weighs in at approximately 330 pounds, making it a two-man job to put together (though wheels on the bottom of the cabinet make it easy to relocate). Simple maintenance tasks, such as adding toner or clearing paper jams, are easy to accomplish. A series of diagnostic lights and error messages alert you to the location of the problem.

On speed tests, the 38-ppm QMS was on a par with the 40-ppm Dataproducts Typhoon; output quality was similar as well. Text is fine at 600 dpi, but graphics are produced at 300 dpi and hence show some dottiness not often apparent in this 600-dpi-and-up universe.

The 3825 Print System is for high-speed, high-output, text-intensive applications, and QMS offers the memory, paper-handling, and network administration support you need to add this workhorse to your printer landscape. The 2425Ex Print System also delivers [illegible] passed paper handling and network [illegible] port, plus excellent output quality [illegible] more manageable package. It is [illegible] one of the best network printers [illegible] able.—*Padraic Boyle*

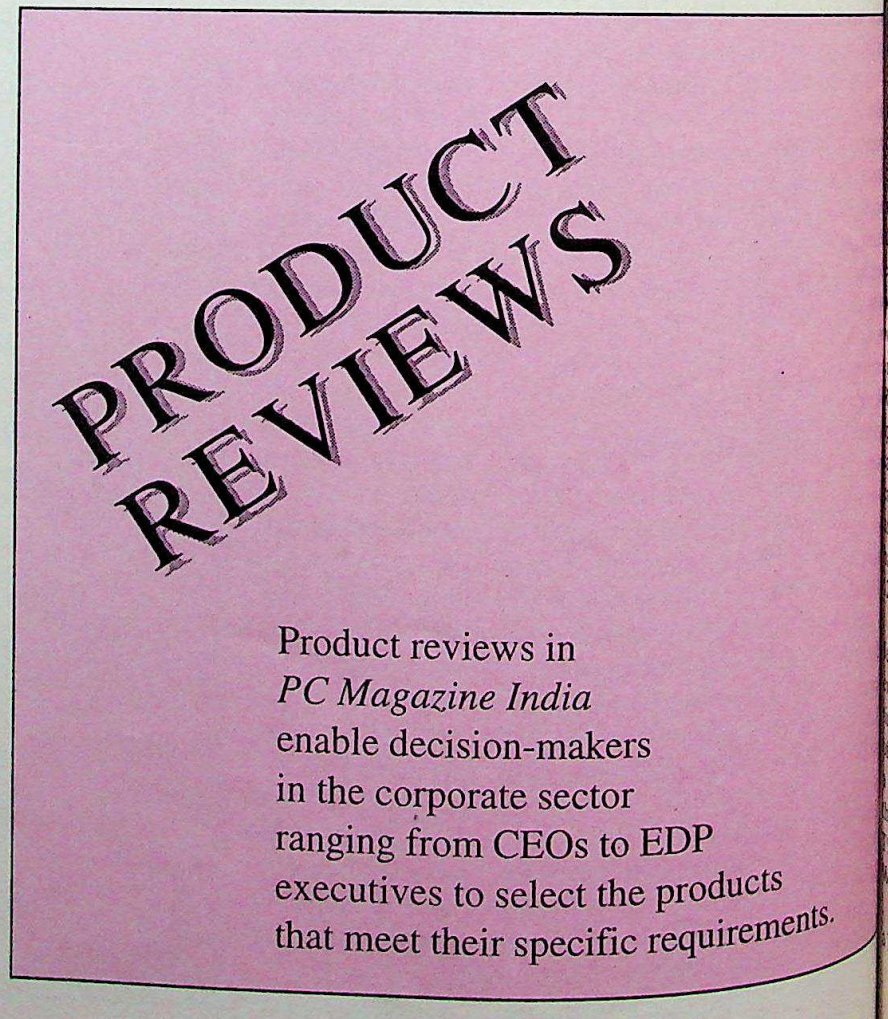
QMS 2425Ex Print System. Price: 15,00,000 (approximately); **QMS 3825 System.** Price: Rs 20,00,000 (approximately) QMS Inc., Mobile, AL;http://www.qms.com *(Indian partner Rolta India, Rolta Bhavan, MIDC Marol, Andheri East, Bombay 093. Tel : 8377708; Fax: 8365992.)*

Xerox Corp.

DocuPrint 4517mp, Xerox 4520mp

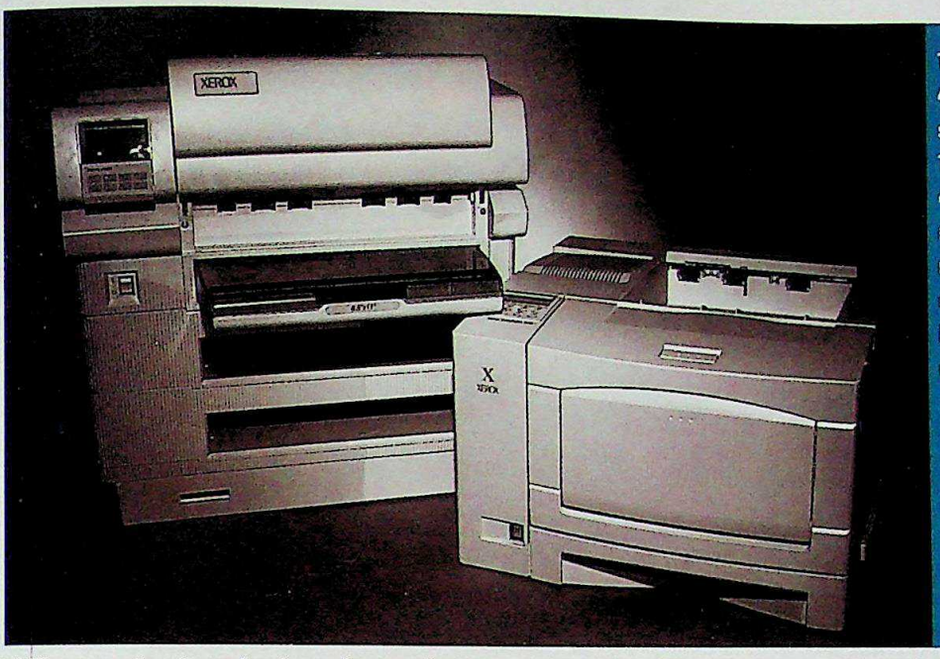
The recently released DocuPrint 4517mp ($2,070 list) from Xerox [illegible] solid value for medium or [illegible] workgroups. This letter- or legal-capable unit delivers 17-ppm speed and resolution up to 1,200-by-600-dpi, plus a range of options that you can tailor to almost any printing situation.

The 20-ppm, ledger-capable Xerox 4520mp ($4,070 list, $3,643 street)



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The Xerox 4250mp soldiers on. The 4517mp, newer and more compact, is just as quick.

meant to be shared by larger groups. Both printers come with Xerox's fine DS/P (Document Services for Printing) administration software and are worthy contenders.

Xerox's *mp*-designated models come standard with PCL 5e and PostScript support, plus network interface cards (models sans PostScript and the network card are available for about $700 less). Xerox's DS/P application offers some welcome features. Like other best-of-breed administration utilities, Version 2.0 offers printer-usage tracking and accounting reports and gives the administrator the ability to hold, delete, and release jobs from the print queue. A feature unique to DS/P is what Xerox terms Best Fit: End users select the criteria they need from the print driver interface (paper size, duplexing on or off, edge-to-edge printing, and so on) and DP/S automatically prints the job to the most suitable printer on the network. Also unlike other utilities, DS/P lets the administrator see and control other brands of printers on the network.

Xerox's other networking features are also noteworthy. These printers can accommodate up to three different network cards, and all three can receive jobs concurrently. So while the printer is busy servicing an Ethernet job, the Token-Ring card can be spooling a job at the same time. Print jobs can also be spooled to an optional internal hard disk ($475 for 250MB) if network traffic is constant.

BestFit lets users select the print criteria they need, and then it finds the best printer for the job.

There are drawbacks, however. HP's JetAdmin and QMS's CrownAdmin2, for example, are more intuitive to use. At the time of our testing, a Windows 95 version of DS/P was not available, so we ran it on a workstation using Windows 3.1. And that version required us to load a DOS TSR before Windows in order for the Windows software to run correctly.

In its basic configuration, the 4517mp is a little sparse in features, but you can customize it to be just about whatever you need. It comes with a single 250-sheet paper tray and a 100-sheet multipurpose tray, and you can add up to two 500-sheet auxiliary trays ($128). There is also a cleverly designed, easy-to-install duplexing unit ($445) that fits *inside* the small-footprint case. Best of all is the mailbox sorter ($1,230), which attaches atop the printer and gives you ten lockable bins for output. The network administrator simply assigns a user (or group of users) to a bin, and those print jobs get sorted to the individual bin—no more sorting through stacks of output to find your job or worrying that others might accidentally walk off with a sensitive or important document.

The printer is rated for 50,000 pages per month, and cost per page is a competitive 2.1 cents. The standard 600-dpi print quality (with resolution enhancement) is excellent: Text is smooth and black areas are solid. Gray-scale images (which we produces at 1,200-by-600 dpi) showed an excellent range of gray levels, with only faint horizontal banding apparent on large images. In terms of performance, the 17-ppm 4517mp was a bit slower in general than the 16-ppm printers in this roundup, though the difference was not enough to be a critical factor for most uses.

The 4520mp is a larger unit meant to be shared by more users than the 4517mp. It comes with three 250-sheet paper trays, and you can add a 1,500-sheet bin ($560) if you need more capacity. The 4520mp has a 75,000 page-per-month duty cycle rating, and the cost per page for consumables is about average (2.2 cents). Print quality from the 600 dpi printer (800 dpi with extra memory) was good for text. Gray-scale images were smooth, though they tended to print too dark on the default settings.

The 4520mp was noticeably slow on our performance tests. It was slower than even the 12-ppm models on some PCL tests, which may indicate a performance flaw in that emulation mode.

The 4517mp and 4520mp come with slightly different warranty terms. Both come with one year of on-site coverage, three years of labor, and the Xerox Total Satisfaction Guarantee: Xerox will replace the unit at no cost with the same or an equivalent model if you are not satisfied with the printer while it is under warranty or under Xerox's service contract (up to three years). The difference is that the 4517mp has an 8-hour response time for the on-site service, while the 4520mp has next-day service.

If you don't need 11-by-17 printing, the 4517mp is the better bargain of the two. It delivers more varied options for paper handling (including lockable mail bins) and prints at equivalent speed for about half the price.—*AP* □

DocuPrint 4517mp is not available in India; **Xerox 4520mp.** Price: Rs 90,000. Xerox Corp., El Segundo, CA; http://.www.xerox.com. *(Indian partner Modi Xerox, Jagannath House, 33 Community Center, New Friends colony, New Delhi 110 065. Tel: 6834294; Fax: 6832836.)*

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It's the Internet, Stupid

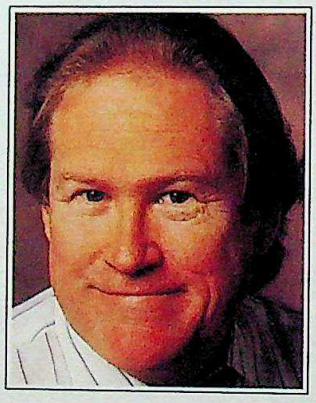
There is no more bandwidth. Once everyone gets connected with their ISDN and cable modems, they're going to find that everything is busy. The system is already at capacity. Nobody wants to talk about it.—*Chicken Little '96*

I laughed when I read this. But I stopped laughing when one night I couldn't access any World Wide Web sites. Everything was slow. These delays are becoming more frequent. What will happen when the entire country is online?

Some years ago, as I was pondering this scenario, I mentioned my concerns to a telephone company executive. The executive assured me that the phone companies could build capacity at an alarming rate, and if there were demand for bigger "pipes," then they would be built. But recently, an employee at a small Internet Service Provider (ISP) in Port Townsend, Washington, told me that his company can't get a simple T1 line, which was ordered six months ago. U S West keeps saying "tomorrow, tomorrow," but never delivers. And U S West is the company that wants to be the first to supply the new Asymmetrical Digital Subscriber Line (ADSL) technology? Hah. It can't deliver what it already offers, let alone an unproven technology still on the drawing board.

Fact is the phone companies are *not* keeping up with demand and are totally clueless about the Internet. They are so preoccupied with the old model that they can't see the potential for making boatloads of money by simply adding more and bigger wires. Worse, the telcos are easily sidetracked by dubious issues. Who cares if Internet technology can allow users to make a mediocre long-distance call, for example? Telcos are bitching to Congress about it. Gee, I wonder if they also object to kids using two tin cans and a string to communicate—it's about the same thing.

The telcos had better figure out fast what is going on. Over the years they have tended to react only when some technology threatened to bypass them. Make no mistake, the whole notion of ADSL is a direct response to the threat posed by cable modems. Until cable modems flop, the telcos will be announcing a slew of premature technologies while sitting idly on real technologies such as frame relay and ISDN. And if cable modems don't flop, expect to see the telcos buying cable companies like there is no tomorrow. The next technology to threaten to bypass these guys will be satellites. One of the subsidiaries of Taiwan-based Acer is expected to announce an under-$2,000 uplink/downlink system within the next year. Others will offer downlink satellite services, using regular phone lines to transmit the uplink requests. People want to be hooked up, and if the phone company can't do it, then someone else will.



I WANT MY WEB

People want to be hooked up, and if the telcos won't do it, someone else will.

To see just how clueless telcos are, look at AT&T's new Internet service, WorldNet. AT&T was swamped with orders because, it said, the demand for free or low-cost Internet access was unexpected. How dumb can they be? Then AT&T told customers they need special AT&T software to browse the Web, as opposed to using any browser of choice, effectively killing off any chance of immediate success. Of course, that assumes you could get the software at all. Nobody I know could get an account. All this can and will change, but in the meantime the telcos are proving once again that they just don't get it. Until they do get it, the phone companies will make enough mistakes to keep the current ISPs in business for a long time.

What the telcos should do is to skip the ISP part of the business and leave it up to the local independents—at least until things shake out. Let the ISPs handhold individual users. The telcos can't do it. Heck, many can't even program their own switches, and none of the telcos understand server technology. All their efforts should go to deploying fiber and copper as fast as possible. The phone company is the tollkeeper to the interstate. Once the road is built, the tollkeeper just collects fees and maintains the road. With people putting second and third phone lines into their homes, the telcos should make a fortune on basic services. My house has three dedicated lines plus an ISDN connection for a total of five distinct lines. There's also a cell phone in my car. Somebody must be making money off this.

The telecommunications boom, which began with cell phones, has accelerated with the expansion of the Internet because of the simple fact that the Net requires more bandwidth than voice lines can deliver. The phone companies must have seen this coming. But you sure wouldn't know it from looking at their track record. □

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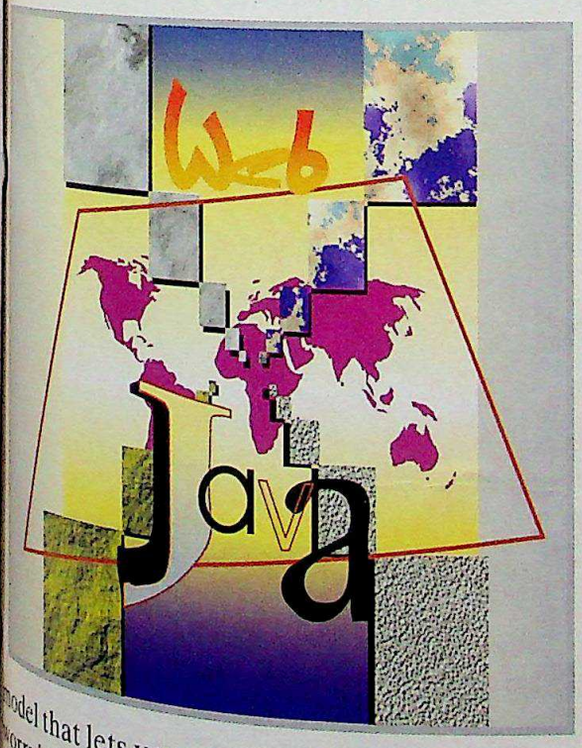
Java and Java Tools: Waking Up the Web

Java promises new, lively Web pages; tools are beginning to appear to ease development.

By John Lam

The hottest topic since the Web itself; the coolest tool for developers—that's Java. Interest in Java has grown explosively since its public debut at the SunWorld conference in May 1995, riding the enormous wave of public interest in the Internet. But what is Java, and why has it become this year's Holy Grail? Java offers developers the power to add dynamic, interactive content to Web pages, making today's static pages a thing of the past. Java also has many attractive features for developers interested in creating Internet-enabled applications.

Java is an object-oriented language that allows developers to create platform-independent applications. It produces small, lightweight code that derives much of its functionality from the class libraries already present on client computers. Since Java is an interpreted lan- guage, a program written using it can run on many hardware platforms without recompiling. It also has a robust security model that lets you create applets your users can download without worrying about something horrible happening to their computers. Together, these features make Java a very compelling



IN THIS SECTION



TUTOR The World Wide Web is a vast, confusing place if you don't have the right tools to help you locate the information you need. Jeff Prosise evaluates a sampling of the best tools for searching the Web, including Alta Vista, Yahoo!, and other sites that combine search tools.



UTILITIES Windows 95's implementation of system hotkeys has some problems. For example, it sometimes allows more than one instance of the same key combination. Our Hotkey Detective utility solves this problem, and lets you keep track of hotkeys in Windows 95.

ALSO IN THIS ISSUE In PC Solutions, we present tips on how to speed up some tasks in Windows 95, a software page eject for your printer, a batch file that counts sequentially, more on inserting logos and letterheads in WordPerfect files, macros for using year-to-date formulas in multisheet Excel workbooks, routines that show you how to simulate spinner controls in Microsoft Access, and a discussion of why you need premastering software in order to create high-quality recordings on CDs.

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tool for developers who want to add the next level of interactivity to their Web sites.

In this article, we will explore several things that are important to developers interested in using Java. First, we'll examine the Java language specification to see what all the fuss is about. Next, we'll take a tour through a sample Java applet that illustrates some common programming themes in Java. Finally, we'll take a look at development environments you can use today to create Java applets.

WHAT'S IT ALL ABOUT?

Java source code can be compiled into either Java applications or Java applets. *Java applications* run as native processes within the Java runtime interpreter, while *Java applets* are downloaded and run within a Web browser such as Netscape Navigator 2.0. Our focus in this article is Java applets.

Java applets are not compiled into machine code. Instead, they are compiled into an intermediate, bytecode format conforming to the abstract Java Virtual Machine specification. The bytecode is then translated by a runtime interpreter on the client computer. Bytecode-based applications have a key advantage over native executable applications: inherent portability. Since the bytecode executes within the Java runtime interpreter, the interpreter can resolve such issues as differences in the instruction sets of the underlying CPU, byte ordering (the "big-endian" and "little-endian" issues), and whether the underlying operating system makes use of Unicode.

You don't need to recompile a Java applet before you can run it on a new target computer: If a Java runtime environment exists on that computer, your unmodified applet will run on it. This portability is what makes Java applets particularly appealing on the Internet. Any number of users, running different Web browsers on different hardware platforms, can download and run the same Java applet you created, thereby leveraging your development investment.

Security is an important requirement for Java applets. Once a Java applet is downloaded to your computer, its functionality must be restricted. In general, Java applets cannot read or write files on the client file system, make network connections (except to the host from which the applet was downloaded), start other applications on the client, make native function calls to the client's underlying operating system, or directly access memory.

These are only guidelines, however, since the exact implementation of the security model is the responsibility of the Web browser vendor. For example, although Netscape Navigator 2.0 doesn't allow the reading or writing of any files, Sun's AppletViewer, which ships with the Java Developer's Kit (JDK), allows applets to read files that are named on the read-access control list.

The Java security model is easily enforceable: The bytecode you download into your Web browser is subject to a verification process before it is executed. Once the bytecode has been validated, it is executed by the Java runtime interpreter, which further augments Java's security by preventing direct access to memory: A Java applet (or application, for that matter) cannot read or write directly to memory. If an applet were to have direct access to memory, it could conceivably access the underlying operating system and thereby violate Java's security model.

So, what happens when you read a Java-powered page on your Java-compliant Web browser? How does a Java applet wind up on your computer? Here's the process:

- The Web browser requests an HTML page from the Web server.
- The Web browser receives the HTMLpage.
- The Web browser interprets the <APPLET> tag, observes that there is a reference to code=app.class, and sends a request to the Web server for a file called "app .class."
- The Web browser receives the app. class file, verifies its bytecode, and begins execution.

As you can see, the Web server's job is to serve up files. Java applets can be served up by any Web server—without any special codes or modifications. And because execution takes place on the client, it is unaffected by bandwidth or HTML limitations.

JAVA'S NATIVE DATA TYPES

Type	Description
byte	8-bit signed
short	16-bit signed
int	32-bit signed
long	64-bit signed
float	32-bit IEEE 754
double	64-bit IEEE 754
char	16-bit Unicode
boolean	True or false
class	Reference
array	Reference
interface	Reference

THE JAVA LANGUAGE

The Java language is based on C++, but with C++ features that are seldom used or would potentially violate Java's security model removed. What remains is a simple, object-oriented, multithreaded language whose features include a single-inheritance class hierarchy, strong typing, support for multiple threads of execution, automatic garbage collection, and the use of references only (no pointers).

The primitive data types Java supports are familiar to most developers (see table). Note that neither unsigned integers nor any pointer types are supported. But since Java does allow native operating system calls, this should not pose a problem for most developers.

Java classes support only single inheritance: A Java class can inherit from only a single ancestor class. This is done using the keyword *extends*, as in

```
public class Foo extends Applet
```

The keyword *public* means that the class is visible to classes outside of the current source file.

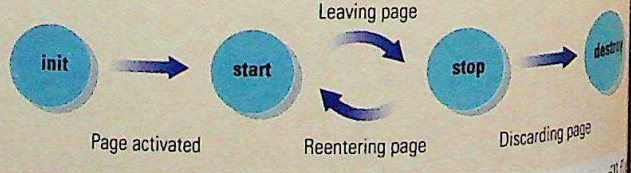
Java classes also support the use of interfaces, which represent a group of related functions exported by a Java class. By using interfaces, you gain several important advantages. First, since an interface defines a consistent view of your object, you can separate how someone uses your object from how you implement the functionality of that object. Second, since a Java class can implement multiple interfaces, you gain some of the benefits of multiple inheritance, despite the fact that Java disallows it. Finally, an extremely important feature comes from the close relationship between Java interfaces and Interface Definition Language (IDL) interfaces. This link allows you to use Java to build distributed objects that conform to the Common Object Request Broker Architecture (CORBA) or Component Object Model (COM) specifications.

Java is a *strongly typed* language. This means that Java tries to resolve all types at compile time. If you reference an invalid type or perform an invalid typecast, Java will flag that error at compile time. As with other object-oriented languages, Java allows polymorphic behavior; that is, you can refer to an object without specifying its exact class.

Java uses reference-counted classes. It automatically increments an object's reference count whenever a piece of code refers to that object. When a reference to an object goes out of scope, Java automatically decrements that object's reference count. When the reference count of an object reaches zero, the object becomes a candidate for garbage collection. A separate garbage-collector

LIFE CYCLE OF A JAVA APPLET

The arrows show the events that take place in the browser; the circles represent the corresponding functions in the Java applet class called to handle those events.



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thread runs within the Java interpreter, taking care of freeing the memory associated with objects with a reference count of 0. Java provides support for *multithreaded* applications. Each instance of a class can be run as a separate thread if it is subclassed from Thread:

```
public class Foo extends Thread
```

But this is suitable only for very simple classes that do not need to be subclassed from anything else. Because Java does not support multiple inheritance, you can't use inheritance to add threading capabilities to your class. If you implement an interface called Runnable in your class, however, Java will add threading support by allowing you to create a new Thread object that may or may not be external to your class.

A SIMPLE JAVA APPLET

The best way to get a feel for any language is to start using it. Rather than the ubiquitous "hello world" example app, we will create a sample applet that animates the *PC Magazine* logo, moving it left and right within a box. This applet will illustrate several of the important concepts in Java programming, such as a class with support for threads, multiple interfaces in a single class, simple animation, parameter passing from the HTML page that contains the applet, obtaining additional files from the Web server, exception handling, and event handling.

We'll examine how the applet is created, how it initializes itself, how it animates the

The State of Java Tools Today

By John Lam

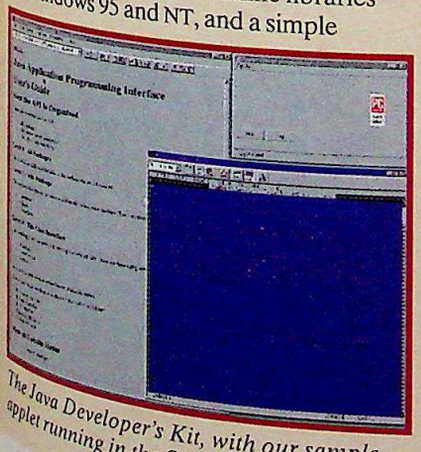
C++ developers are accustomed to using integrated development environments (IDEs). Since the Java language is very similar to C++, it seems fair to evaluate Java development environments relative to existing C++ development environments. Not surprisingly, the Java development environments we'll look at here are either close relatives of or add-ons to existing C++ development environments.

Developers expect five major features from an IDE: source-code editing and browsing, application-resource editing, integrated compiling, integrated debugging, and online help. We'll evaluate the Java development environments in terms of these categories, the most important of which is perhaps online help: When learning a new language, it is beneficial to have rapid access to documentation about the language and its class library.

TODAY: THREE CONTENDERS

At the time of this writing, three environments are available for creating Java applets and applications in Windows 95 and Windows NT 3.51.

The Java Developer's Kit (JDK), Version 1.0, from Sun Microsystems, contains the Java compiler, the Java runtime libraries for Windows 95 and NT, and a simple command-line debugger. We'll also discuss two products that ship with JDK, significantly enhancing it: Symantec Corp.'s Symantec Café and Borland International's Borland C++ Development Suite 5.0.



The Java Developer's Kit, with our sample applet running in the Sun AppletViewer.

THE JAVA DEVELOPER'S KIT

The JDK, Version 1.0, provides a minimal set of the tools and documentation you need to create Java applets and applications. The tools include the Java compiler, the Java Appletviewer, and a simple command-line debugger. The required Java class libraries—with source code—also ship with the package. To help you get started, the JDK includes a set of documentation for the Java class libraries and a variety of sample Java applets.

Unfortunately, the JDK does not provide tools that let you create Java applets easily. The documentation is not searchable, as is the case with standard Windows help files. (Luckily, a port of the Java class-library documentation to Windows help-file format *is* available, at *http://www.dippybird.com/java.html.*) The JDK does not include a Java source-code editor, a make tool for your Java projects, nor an easy way for creating your Java applet's visual elements. Longtime Windows programmers will be reminded of those days when they had to create dialog resources using Notepad.

The one thing you can't complain about, however, is the JDK's price: You can download it for free from Sun's Java Web site. Use the JDK to take a look at what Java is all about before deciding whether you want to purchase a full-blown Java development tool. At the least, you can compile the sample applets using the compiler and write a simple applet to get your feet wet. But when you're ready to do more than that, you'll want to get a real development environment.

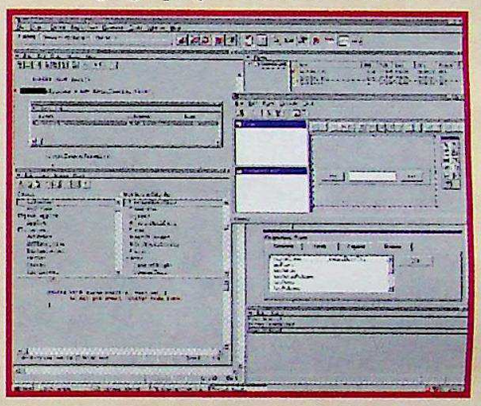
The Java Developer's Kit 1.0. Price: Rs 9,950. Sun Microsystems Inc., Mountain View, CA; http://www.javasoft.com.

(Indian subsidiary Sun Microsystems India, Bangalore; Indian partners Wipro, Bangalore; TCS, Bombay.)

SYMANTEC CAFÉ

Symantec Café is a standalone Java development environment based on Symantec Corp.'s excellent C++ development tool. Not surprisingly, Café incorporates many features from that product, providing a very complete environment for creating Java applications and applets.

Managing a project's source-code files and their associated windows is a task that IDEs try to simplify for developers. Café makes it easy to manage these windows, by creating a set of virtual desktops that are navigable with a simple tab control. Café groups these desktops into five categories: Editing, Project, Output, Desktop, and Debugging. Within each desktop, you can customize the appearance and layout of the individual source-code windows.



The Symantec Café Resource Editor, with a form opened up in its window.

Navigating and editing the source files in your project are also important. Café lets you navigate by file or class, plus provides syntax highlighting of your Java source files during editing. The editor is also tightly integrated with both the help files and the compiler. When a compile-time error occurs, you can jump directly from the error message in the output window to the line in your source-code file where the error was detected.

Café's bytecode compiler really shines. In

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.GIF file, how a user interacts with it during its lifetime, and, finally, how it gets destroyed.

The first thing you must do when writing a new Java applet is to create a new class that subclasses from the java.applet.Applet class. In our applet, this new class is called Simple, and it implements several member functions that are called by the Java runtime environment at different times throughout the lifetime of the applet (see diagram). These member functions are init(), start(), stop(), and destroy(). The init() function is called the first time an applet is loaded by the Web browser. The start() function is called when the Web page is activated by the browser (that is, when a user first visits or again visits the page), and the stop() function is called when the user leaves the page. As a good Java citizen, you should suspend the execution of your applet when the Web browser calls your stop() function. The destroy() function is called only when the browser unloads the applet from memory. At that point, you free any resources you may have created.

Java calls our applet's init() function to perform per-instance initialization of the applet. The applet uses parameters from the HTML page that launched it to define how large it will display on the screen. The parameters are set up inside the <APPLET> tag in the HTML source file:

```
<APPLET CODE=Simple.class WIDTH=300
HEIGHT=300 STEPSIZE=10 INTERVAL=100>
</APPLET>
```

contrast to javac, the Java compiler that ships with the JDK, Café's compiler is fast, making the entire compile-test-debug cycle much quicker. The Java runtime environment has also been optimized, resulting in Java applications that run much more rapidly than was possible with the runtime environment that ships with the JDK. Keep in mind, though, that it's the implementation of the Java runtime environment on the receiving system that determines your applet's performance in the eyes of the end user.

Café has an integrated debugger that provides the features with which C++ developers are familiar. Café also supports simple or conditional breakpoints, call-stack tracing, watch expressions, single stepping, and procedure stepping. You can even debug multithreaded Java applets on the fly.

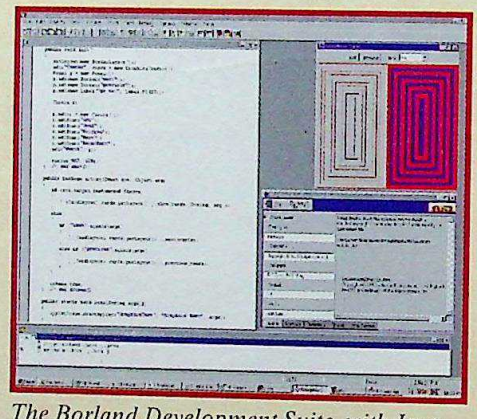
The Java language specification does not define resources, but Café uses a Windows resource editor to lay out the user-interface widgets you use in your Java applet. This allows you to drag and drop the widgets onto a form and to attach event handlers to them. Café maintains this information in a Windows .rc file and generates the Java code required to lay out the user-interface widgets on the form. You can add an event handler to a button's click-event by clicking on the button, selecting the Events tab of the button's property sheet, and selecting the click-event. Café will then create a stub procedure for you and take you to that procedure in the editor, so that you can add your event-handling code.

At this writing, Symantec Café represents the best option for most Java development. For more information, see this issue's First Looks section.

Symantec Café. Price: $299.95. Symantec Corp., Cupertino, CA; http.www.cafe. symantec.com. *(Indian partners InfosysTechnologies, Bangalore; Sonata, Bangalore; Svam Software; New Delhi.)*

BORLAND C++ DEVELOPMENT SUITE 5.0

In the new Borland C++ Development Suite 5.0, which includes a set of Java add-on tools, Borland capitalizes on its award-winning C++ environment to deliver a productive IDE for creating Java applications and applets. But the Development Suite is not a standalone Java development environment; some inconsistencies in Borland's approach detract from this product's appeal.



The Borland Development Suite, with Java add-on showing AppExpert for Java.

The Development Suite is an excellent environment for browsing and editing source-code files; it obviously benefits from the project management and file-browsing support that have made Borland's IDE such a productive environment. The Development Suite provides project file management, integrated version control with PVCS, and a syntax highlighting editor.

It also has AppAccelerator, one of the first implementations of a Java just-in-time compiler. AppAccelerator compiles the bytecode generated by the Sun javac compiler into native machine instructions prior to execution. This can provide a significant performance boost, and it foreshadows the way Java applets will run in the future. As with Symantec's optimized Java runtime environment, the runtime environment on your users' computers will ultimately determine how quickly your Java applet will execute.

The Development Suite falls short in the Borland Graphical Debugger. The debugger, itself written in Java, must be launched inside the Java runtime environment before your application is launched. Borland's debugger supports most of the features developers require, such as breakpoints, watches, and a call-stack trace, but it is slow and not always reliable. It also takes an inordinate amount of time to begin a debugging session, and the debugger itself is prone to crashing.

Sadly, the Development Suite does not support graphical form building; thus, you must calculate by hand the coordinates of various user-interface widgets, then hard-code these values into your application. The Development Suite also lacks support for hooking up events to the widgets, so you must hand code the handlers for the events you want handled. Though not absolutely essential, these features are important time-savers that must be addressed in future releases.

The Borland C++ Development Suite 5.0. Price: Rs 39,950. Borland International Inc., Scotts Valley, CA; http://www.borland.com. *(Indian partners Datapro Infoworld, Pune; Wipro, Bangalore.)*

STOP THE PRESSES

Several new Java tools appeared too late for this roundup. Rogue Wave (*http://www.roguewave.com*) recently announced its JFactory development environment, and Microsoft previewed its Jakarta development environment at its Internet Professional Developers' Conference. At the Software Developers' Conference, Sun Microsystems showed off a beta of Java Workshop, a GUI development environment consisting of a code editor, a debugger, and a portfolio manager. With the ever-increasing popularity of Java, more products are sure to appear soon.

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LASTING
Impressions

In a scenario where computer consumables were considered inconsequential, Somani had the conviction of branding a Computer Printer Ribbon. Thus was born ABEE.

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Microsoft ActiveX Technologies

Is Java the only game in town for creating interactive Web applications? Not anymore. At the Internet Professional Developers' Conference (PDC), Microsoft announced its ActiveX technologies for creating interactive Web applications. These advances include client technologies, server technologies, tools, and applications.

Three main components make up the ActiveX client technologies: ActiveX Controls, ActiveX Documents, and ActiveX Scripting. At the PDC, Microsoft released the ActiveX Development Kit, which is available for free downloading at Microsoft's Web site (*http://www.microsoft.com/intdev/sdk/*). The kit contains documentation, sample code, and code libraries that allow you to start building ActiveX client applications using the ActiveX technologies.

ActiveX Controls function just like traditional OLE Controls (OCXs): They can reside locally on a client machine or they can be downloaded from the Internet. You can use ActiveX Controls to handle client-side interactions with the user. An ActiveX Control may be as simple as a button or as complex as a reporting tool. Since the same ActiveX Controls can also be used inside Visual Basic, you can expect to see a proliferation of ActiveX Controls that you'll be able to use in your Web pages.

Developers can use ActiveX Scripting to coordinate the activities of ActiveX Controls on their Web pages. Currently available ActiveX Scripting languages are VBScript and JavaScript. These scripting languages use OLE Automation to communicate with an ActiveX Control; the ActiveX Control fires OLE events that can be handled in the ActiveX Script code in response to user interactions (such as clicking on a button in the ActiveX control).

ActiveX Documents are an exciting piece of technology. Using Microsoft Internet Explorer 3.0, you can view active documents as well as HTML pages. In addition, you can allow users to navigate, view, and edit the contents of documents that can't be rendered using straight HTML alone—all within a Web browser, thus providing users with a consistent interface. The forthcoming Explorer upgrade (code-named Nashville), which will be released later this year, will allow you to browse your local hard disk, your local area network, or the Internet from within the same user interface.—*John Lam*

We need to get these parameters before the applet appears on the Web page. By calling the getParameter() function, which is implemented in our java.applet.Applet superclass, we can obtain the parameters from our Web page. The getParameter() function returns a String object that must be converted to a simple int value. The lines of code

```
String ap = getParameter("STEPSIZE");
stepSize = (ap != null) ?
Integer.valueOf(ap).intValue() : 5;
```

demonstrate Java's interesting use of classes to perform the required type conversion. In the first line, we create a new String object and initialize it with the String returned from the getParameter() function. The second line of code shows how Java allows you to refer to a class as though it were an object. Java automatically instantiates an Integer object to perform the actual type conversion.

Our applet must also download the .GIF file for the *PC Magazine* logo from our Web server. We initiate the download by calling a member function of the Applet class, getImage(), which takes two parameters, a URL and a filename, and returns an Image object. For security reasons, a Java applet cannot establish network connections to hosts other than the one from which it was downloaded. Therefore, the applet uses the function getCodeBase() to obtain the only URL it can access, our applet's host.

Next, we need to know the dimensions of our Image object. Rather than hard-coding the size of the .GIF image into our applet or into parameters embedded in the HTML page, we can ask the Image object to tell us its size. But one of Java's underlying design considerations makes this less simple than you'd think: Java intentionally defers the actual transfer of objects over the Internet until it absolutely has to (that is, until it must render the image on the screen). Simply calling getImage() does not actually load the .GIF image. Instead, we must *asynchronously* request the size of the Image. To support such asynchronous processing, Java uses a callback interface. Our Simple class implements an ImageObserver interface which contains a single function, imageUpdate. This function is called with the size of the image passed in its parameter list when the image is actually loaded into memory, and its dimensions become known.

Once our applet has been initialized, we're ready to start execution. The Simple class is multithreaded, but since our class already inherits from the java.applet.Applet class, we can't use inheritance to add threading capabilities to our class. Instead, we must implement the Runnable interface with its single member function, run(). This is the member function that will be called from an external created Thread object when it is time to start running our Simple class.

When the browser is ready to start our applet, it will call the applet's start() function. At this point we create a new thread object, moveImage, which controls the execution of our Simple object. We then call the start member function of Thread, which in turn calls our Simple object's Runnable interface run() function.

The Runnable interface controls the execution of our Simple class. Runnable's run() function contains an infinite loop: a while (true) statement block with a try ... catch block nested within it. This is a good illustration of Java's exception-handling abilities. The exception handler looks for anything that interrupts the execution of our thread (such as the user pressing Ctrl-C in the AppletViewer that ships with the JDK). When an exception occurs, we destroy the thread from within which we were executing and exit the run() function.

How do we animate the *PC Magazine* logo? The run() function puts the thread to sleep after the thread has moved the Image object one step to the left or to the right. If run() detects that the Image has reached the left or right boundary of the applet's viewable area, it reverses the direction of the box and sends it the other way. Upon waking, run() causes the applet's viewable area to be repainted.

Java, as with any language used for creating applications that run inside a graphical user interface, must provide handlers for system messages. For example, when the operating system requires that our window be repainted, say in response to a user moving an overlapping window to reveal our applet's window underneath, the OS will inform us, and the Java paint() function will handle the task. The paint() function takes a single parameter, a Graphics object which is an encapsulation of a logical drawing surface. The paint() function takes care of the issues involved in rendering our logical drawing surface using the underlying operating system API functions. We use the member function of the Graphics class to draw our *PC Magazine* logo onto a logical representation of the window within which our applet is executing.

To see the applet, visit *PC Magazine*'s Web site (*http://www.pcmag.com*). You can download all of the source code from PC Magazine Online. □

John Lam is the director of software development at Continuous Research, a company specializing in the creation of OCX-based tools for developers.

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By Jeff Prosise

Researching With the Web

How to find exactly what you're looking for on the Internet—lickety-split.

Like the Energizer bunny, the World Wide Web just keeps going and going. Nobody knows exactly how many pages there are on the Web, but the latest estimates peg the count at somewhere in the neighborhood of 20 million pages containing more than 10 billion words of text. The Web is an immense repository of information, but how do you know where to go to find data on corn farming in Iowa or to find pictures of humpback whales? Searching the Web for information on a particular subject by randomly surfing can waste a lot of time.

If you're a newcomer to the Web, you'll be pleased to know that several companies have taken it upon themselves to build huge databases of information gathered from the Web. Given a search key such as the phrase *humpback whale*, these databases take a matter of seconds to return the URLs (uniform resource locators) of all (or nearly all) Web pages known to contain the search key. Access to the databases is provided through "search sites" on the Web itself. For example, *http://www.yahoo.com* is the URL of Yahoo!, one of the most popular search sites on the Web. Just go there with your browser and you'll see a simple form that you can fill out to initiate a search. When the search is complete, you'll be presented with a page containing descriptions of and links to all the sites that produced a "hit" during the search.

How much does it cost to use a search site? That's the best part. Access to most search sites is free, because the companies that support them make their money by selling advertising space on their Web pages.

Most search sites use automated programs (variously known as *web crawlers*, *spiders*, and *robots*) to scour the Web continually and keep their databases up to date. Certain databases are far more extensive than others, and different sites offer varying levels of search capability. For example, at most sites you can use Boolean operators such as AND, OR, and NOT to narrow the scope of a query. A few sites support "fuzzy" searches to account for mistaken or unusual spellings. And some sites index Usenet newsgroups and other parts of the Internet in addition to the Web. All in all, there's something out there for everyone and something to help track down almost any kind of information you desire.

To help you conduct research on the Web, I've compiled short descriptions of some of my favorite free search sites. I also conducted an unscientific test at each site by performing a search on the word *Cozumel* as part of research I'm conducting for a dive trip I'm planning. Generally speaking, more hits indicate a more extensive database. Keep in mind, however, that more is not always better. It's a lot easier to visit 10 Web pages than it is to visit 100. And if 90 of the sites are irrelevant, you've wasted a lot of time unnecessarily.

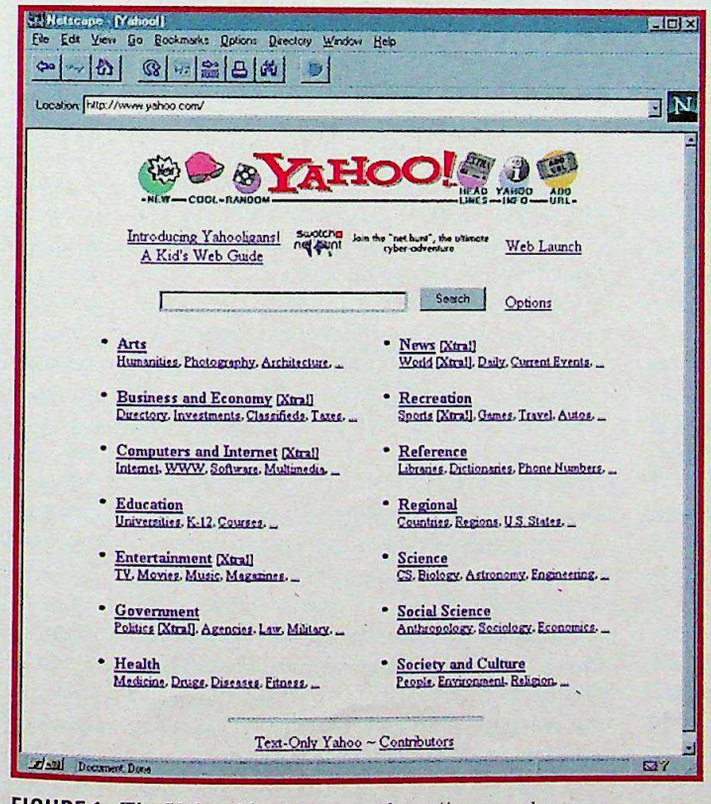


FIGURE 1: *The Yahoo! home page at* http://www.yahoo.com.

YAHOO!

Yahoo! is considered the granddaddy of Web search sites, because it is generally accredited with being the first one to come online. It's also one of the most commercially successful; according to one news magazine, Yahoo! generated more than $1 million in advertising revenues in 1995. *PC Magazine*'s owner, Ziff-Davis Publishing Co., recently joined forces with Yahoo! to publish a magazine called *Yahoo! Internet Life*.

Yahoo! is usually the first place I go when I do research on the Web, because its database is extensive, but not so extensive that a simple search turns up more URLs than one can possibly visit. Searching on *Cozumel*, for example, turned up nine Web pages. The same search turned up hundreds of matches at some of the competing search sites.

Yahoo! offers a simple set of search options that provide some versatility in the types of searches performed yet aren't likely to overwhelm a new user (see Figure 1). You can search on single words or you can type in multiple words and click a button to tell the search engine whether to find pages that contain *all* the words (the equivalent of using a Boolean AND) or *any* of the words (a Boolean OR). You can also specify whether the search should include pages with words matching the search keys or words that *include* the search keys. When the latter option is selected, a search for *land* will turn up Web pages containing the word land as well as Disneyland, Greenland, and other supersets of *land* that are completely irrelevant, like glandular and clandestine.

Yahoo! also offers a hierarchical list of Web sites sorted by category. Click on Education, for example, and a second list appears containing subcategories such as Adult Education, College Entrance, and Courses. Work your way downward through the hierarchy and eventually you'll find links to Web sites containing information on very specific subjects. You can also pause at any point and perform searches targeted to the category or subcategory you're in.

LYCOS

Another popular Web site frequented by those in search of information, Lycos (*http://www.lycos.com*) claims to have in-

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dexed more than 90 percent of the Web. A search on *Cozumel* turned up a list of 453 Web pages. Besides providing a comprehensive indexed reference to the World Wide Web, Lycos indexes Gopher, FTP, and HTTP files found elsewhere on the Internet. It also includes an extensive directory of about 40,000 of the most popular sites on the Web and reviews of more than 7,000 of them.

Lycos is among the fastest and most flexible search engines available on the Web. To help you deal with the staggering number of URLs it often returns in response to a simple query, Lycos uses a proprietary algorithm to estimate the relevance of each document it finds. A keyword appearing in a document title, for example, will produce a higher relevance rating than a keyword appearing in the body of the document. Documents with higher ratings appear first, and you can adjust the search sensitivity to weed out documents with lower relevance ratings. This reduces the number of hits reported and theoretically does so without reducing the value of the information returned. If speed and thoroughness are among your key criteria for selecting a search site, Lycos is definitely one of the sites you'll want to consider.

ALTA VISTA

Arguably the most comprehensive index of documents on the Web, Digital Equipment Corp.'s Alta Vista (*http://altavista.digital.com*) is thorough to a fault: Unless you're very specific about your search criteria, it often turns up so many matches that you can't possibly investigate them all. My search on *Cozumel* turned up "about 1,000" hits—so many that Alta Vista reported an approximate number rather than an exact one.

Alta Vista has been online only since December, but already it is one of the most popular sites on the Web, logging several million HTTP requests every day. It claims to have indexed more than 11 billion words on 22 million Web pages, and it includes a full-text index of more 13,000 newsgroups. It's fast; the machine that does the indexing and handles queries from the Web server is a ten-processor AlphaStation with a 210GB RAID hard disk and—get this—6GB of RAM. The spider that crawls the Web and feeds pages to the indexer is no slouch, either. It runs on a DEC 3000 with a 30GB hard disk and 1GB of memory. According to the folks at Alta Vista, the spider is the fastest in existence and fetches pages at a rate of 2.5 million per day. That means the Alta Vista database can be updated every few days, which reduces the likelihood that a search will turn up a page that no longer exists or miss one that has just come online.

Alta Vista's query language supports Boolean AND, OR, and NOT operators, as well as NEAR operators for proximity searches. NEAR specifies that two words must appear within ten words of each other in a document. For example, searching for *Edward Murrow* will miss references to Edward R. Murrow, but searching for *Edward NEAR Murrow* will not.

Alta Vista's query language also includes keywords for restricting searches to certain parts of a document—to document titles and to embedded links to other Web sites, for example. Ever wonder how many other pages on the Web contain links to your own Web site? You can find out with Alta Vista. Just enter the following search text on the Simple Query page:

```
+link:http://www.mysite.com -url:
➥http://www.mysite.com
```

Be sure to substitute your own URL for *www.mysite.com*. Links to your site from your site will be excluded, so you'll get a realistic count of the number of external links to your Web page.

EXCITE

Another search site I find myself stopping at frequently is Excite (*http://www.excite.com*). Though not as comprehensive as Lycos and Alta Vista—Excite claims to have indexed more than 1.5 million Web pages, and it turned up 30 pages containing the word *Cozumel*— Excite offers a compelling feature that few other search sites can boast: the ability to search by content rather than keyword. A search on *scuba diving*, for example, might turn up information on dive spots contained within Web pages that don't specifically include the words *scuba diving*.

Excite also includes searchable reviews of more than 50,000 Web sites, indexes for more than 1 million articles from about 10,000 newsgroups, and a fully searchable copy of the last two weeks' worth of classified ads from Usenet.

My primary complaint about Excite is that searches tend to be several times slower than searches performed on other premiere search sites. I'm unsure whether this is because of the demand placed on the site by concurrent users, an inferior search engine, or simply an underpowered server, but the speed difference is noticeable. Once you've gotten used to the speed of Lycos and Alta Vista, it's hard to settle for anything less.

WEBCRAWLER

WebCrawler (*http://www.webcrawler.com*), which is managed by America Online but accessible to anyone on the Web, isn't the fanciest search site around, but it is one of the cutest. A cartoonlike spider in the logo makes WebCrawler's home page attractive to children, and the interface to the search engine is simple enough probably for second and third graders to use. WebCrawler's database isn't as extensive as some of the others mentioned in this article, but it's useful nonetheless. It managed to turn up 148 pages containing the word *Cozumel*. The site also includes interesting facts about how WebCrawler was started and how it works—perfect for someone who'd like to learn more about spiders and other denizens of the Web.

OTHER TIPS

If you're a one-stop shopper, place a bookmark on Netscape's Internet Search page, found at *http://www.netscape.com/escapes/internet_search.html*. There you'll find an up-to-date list of the dozen or so most popular search sites and hypertext links to get you to the sites themselves.

There is a separate class of Web search sites that delegate their work to other sites; some will let you search several online indexes at once. For example, Net Locator (*http://.com*) performs searches using Alta Vista, Lycos, or any one of a number of other popular Web databases. If you tend to use several search sites to do your research rather than just one, Net Locator can serve as a standard interface to all of them. A relatively new search site, All4one (*http://easypage.com/all4one*), will take one query and execute it on four search sites simultaneously—Yahoo, Lycos, Alta Vista, and WebCrawler—so you can be virtually certain of not missing a useful page that's relevant to the subject you're researching.

The ultimate in Web search tools is Quarterdeck's WebCompass. Like Net Locator and All4one, WebCompass performs searches by submitting queries to existing search sites. But it also does much more. For example, it will retrieve documents identified by a search and build a local database for you containing summaries of those documents. Most of the work is performed by an "agent" that runs in the background and uses its own algorithms and heuristic rules to analyze each document's content, generate abstracts, and group documents together. WebCompass is not a Web site; it's a separate software product that works in conjunction with existing Web browsers. For more information (and to download a free "trialware" version of WebCompass Personal Edition), point your browser to *http://www.quarterdeck.com*.

Next time you have research to do, try some of the pages mentioned in this article and see if they don't make your job easier. The Web isn't everything—it's no replacement for a good encyclopedia or a comprehensive media archive, for example—but for locating any kind of information that might appear on somebody's Web page, it's perfect. And you can't beat the price. □

Jeff Prosise is a contributing editor of Magazine.

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By Gregory A. Wolking

Explore Hotkeys in Windows 95

Hotkey Detective lets you manage hotkeys and find duplicates.

Remember the Shortcut Key feature in the Windows 3.1 Program Manager, which lets you press a key combination to launch a program? You may not realize it, but Windows 95 also has support for this type of hotkey, though it's quirky at best, buggy at worst, and poorly documented. (Apparently the people at Microsoft figured that if they couldn't get it right, they might as well downplay it.) In this article, I'll share what I have discovered about Explorer's implementation of hotkeys and give you a utility program that can help you use this feature effectively and avoid some of its bugs and pitfalls.

The most serious problem with hotkey support in Windows 95 is that Explorer, unlike Program Manager, does not prevent you from assigning duplicate hotkeys. The only clue you'll have of a duplicate assignment in Windows 95 is strange behavior: If you assign a hotkey and it keeps activating different shortcuts depending (apparently) on the phase of the moon or the color of your socks, you've got a duplicate assignment—*somewhere*.

Worst of all, Explorer provides no way whatsoever for you to display what hotkeys are in use and to what shortcuts they are assigned. To find duplicates, you must open the Properties page for each and every shortcut in your entire Start Menu folder tree and on your Desktop, then make a list of all the hotkey assignments you find—unless you have Hotkey Detective.

Hotkey Detective lists the hotkeys in use on your system, along with their associated shortcuts, and launches Explorer for you if you want to make changes. Because the list is sorted by hotkey name, any items with duplicate assignments will be grouped together. Hotkey Detective also provides an automatic refresh feature to keep itself up-to-date as you make changes, and it can print a list of your hotkey assignments.

You can obtain Hotkey Detective by downloading it from PC Magazine Online or by mail. (Refer to the sidebar "Guide to Our Utilities" for details.) The source code in Microsoft Visual C++, Version 4.0, can also be found online for those interested in seeing how it works.

USING HOTKEYS IN WINDOWS 95

Before discussing Hotkey Detective, I need to explain how to use hotkeys under Windows 95. I obtained much of the following information through my own experimentation and observation. Most of these features and behaviors are not documented, and what little documentation I have found ranges from virtually useless to completely wrong.

First of all, I should point out that Windows 95 uses the term *shortcut key* to refer to what everyone else in the industry calls a *hotkey*. I have chosen to stick to the traditional terminology, because the term *shortcut* is heavily overused in Windows 95 for many different concepts related to both using Windows and writing Windows programs. In this article I use *shortcut* to refer to a file with the extension .LNK (or .PIF in the context of a DOS-based program) that Explorer uses to point to another program, document, or folder, and I use *hotkey* to refer to a combination of keys that Explorer uses to activate a shortcut.

IN THIS ISSUE

Hotkey Detective

Hotkey Detective lists the hotkeys in use on your system, along with their associated shortcuts, and launches Explorer if you want to make changes.



Program Manager and Explorer are similar in that they both let you assign hotkeys to shortcuts (under Program Manager, shortcuts are called *program items*). Both shells implement hotkeys using an internal table to map each hotkey combination to a particular shortcut. But that is where the similarity ends. Program Manager's implementation is more robust in some important ways. It lets you use a wider assortment of key combinations than Explorer, and it's smart enough to prevent you from assigning the same hotkey to two different shortcuts. Program Manager also does a better job of maintaining its internal hotkey table when you make changes to your hotkey assignments.

Explorer's shortcuts appear in one of two forms. When you create a shortcut to a Windows executable file, a document, or a folder, Explorer creates a file with the extension .LNK. When you create a shortcut to a DOS executable file, Explorer creates a file with the extension .PIF. Note that there is no such thing as a shortcut to a .PIF file. While Explorer makes it appear that you can create such a shortcut, actually it creates a duplicate copy of the .PIF file and places it in the desired location. In other words, you'll never see a .LNK file that points to a .PIF file.

Explorer can assign a hotkey to almost any shortcut on your system. Explorer, however, will *use* a hotkey only if the associated shortcut is located either directly on your Desktop or somewhere within your Start Menu's folder tree. Hotkey Detective lists only the hotkeys that Explorer actually uses. Pressing an assigned hotkey launches or activates the corresponding shortcut no matter where you are in Windows—even when you're running a DOS application full-screen. This is a major improvement over Windows 3.1, in which Program Manager had to be the active window before a hotkey would launch a program. If Program Manager wasn't the active window, a hotkey could only activate a running application. Perhaps Microsoft took the hint from Douglas Boling's earlier *PC Magazine* utility HK.EXE which added this functionality to Windows 3.1.

The only type of shortcut that can't be accessed with a hotkey is a DOS application that is configured to run in MS-DOS mode, since this mode requires shutting down all other applications and (in some cases) restarting your system. If you have configured an application to run in MS-DOS mode, its Shortcut Key selector field will be disabled.

To assign a hotkey to a shortcut, right-click on the shortcut and select Properties from its context menu. Click on the Shortcut tab (for Windows programs) or the Program tab (for DOS programs), then click on the Shortcut Key field. Press the key you want, then click the OK button. If you want to remove a hotkey setting, press Del, Spacebar,

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or Backspace after activating the Shortcut Key field.

This method also works to assign a hotkey directly to a DOS executable (.COM, .EXE, or .BAT) file. When you make such an assignment, Explorer automatically creates a new shortcut (.PIF) file, named "Shortcut to" followed by the original filename, in the same folder. For Windows applications, you must create the shortcut before you can assign it a hotkey.

You can get help for the Shortcut Key field by right-clicking on it, then selecting What's This? from the context menu. The resulting pop-up help message is useful in telling you how to assign a key but wildly inaccurate as to the rules for what key combinations are allowed. In fact, there are two completely different sets of rules, one for the .PIF files used by DOS programs and one for .LNK files used by Windows programs.

For .PIF files, you can use just about any key combination you want as long as it includes at least one of the modifiers Shift, Ctrl, or Alt. If NumLock is on when you're setting the assignment, you can use keys on the numeric keypad by themselves, without any modifiers at all. Don't go overboard, though, because some combinations can cause major headaches. For example, it is perfectly legal to assign Shift-A as the hotkey for a .PIF file. Unfortunately, that means every time you type a capital A using the Shift key, Explorer will intercept the keystroke and activate the corresponding shortcut. The important thing to remember is that once you assign a hotkey to a shortcut, that key combination becomes unavailable to *any* other program, even Explorer itself!

When you're setting the hotkey for a .LNK file, things get really weird. Unless the base key is on the numeric keypad and NumLock is turned on, Explorer tries to force the modifiers Ctrl and Alt. For example, pressing Ctrl forces Ctrl-Alt, as does pressing Alt alone. Explorer will let you assign the shift toggle keys (NumLock, ScrollLock, and CapsLock) as base keys, even though such combinations rarely work once assigned. About the only rule that seems to apply consistently is that your hotkey combination cannot include the Spacebar, Tab, Enter, Esc, PrintScrn, Backspace, or Pause keys.

Now we get to an actual bug: Explorer doesn't always update its internal hotkey table properly. In particular, removing a hotkey assignment doesn't always work. The hotkey you remove may become "ghosted" and continue to launch the associated shortcut until you either delete the shortcut entirely or restart the system. This bug interacts with Explorer's other shortcoming: It doesn't prevent you from assigning the same hotkey to more than one shortcut.

That's right—you could assign the same hotkey to every shortcut on your system. And it's nearly impossible to predict exactly which shortcut will be launched by a shared hotkey. Fortunately, Hotkey Detective will reveal this error and allow you to correct it.

USING HOTKEY DETECTIVE

HotKey Detective consists of a single executable file, HKD.EXE. It requires no additional runtime modules or support files, so installation requires nothing more than placing the HKD.EXE file in the directory of your choice and optionally creating a shortcut for it in your Start Menu folder. It does not matter whether the directory you choose for installation is included in your system's PATH statement or not.

When you run HotKey Detective, it scans your Desktop folder and your entire Start Menu folder tree, extracting the hotkey assignments from each and every .LNK and .PIF file it finds. It presents an alphabetized list of the assignments it finds in the Key List box (see Figure 1). If it detects any duplicate hotkey assignments, it displays an appropriate message beside the box and selects the first of the duplicates in the list.

The Key List box serves two functions: to show you which shortcuts your hotkeys are associated with and to help you locate the shortcuts themselves. When you select a key name in the list, the fully qualified filename of the corresponding shortcut appears in the Shortcut Filename box at the bottom of the window. If the filename is too long for the text field, you can resize the dialog box and the controls will adjust themselves accordingly.

To change a hotkey assignment, you can double-click a key name, or you can select a key name and either click the Locate with Explorer button or press Enter. HotKey Detective then launches Explorer in dual-pane view, with the shortcut selected (and ready for editing) in the right-hand pane and the appropriate segment of the folder tree opened in the left-hand pane. Note that HotKey Detective launches a separate instance of Explorer every time you use this function. Therefore, you'll keep your screen much neater if you close Explorer after making a change and before using HotKey Detective to locate another shortcut for editing.

There are two reasons that HotKey Detective delegates the change function to Explorer rather than performing it internally. The first is that the structure of .PIF and .LNK files is not documented. It took me many, many hours of fiddling about with a binary editor to figure out how the hotkey information is stored, so it would be risky (not to mention foolish) to manipulate the files directly. The second reason is that even if I had known the exact structure of the files and was positive that I could modify them without mistake, I couldn't get Explorer to reread the modified files and update its internal hotkey table. Delegating the changes to Explorer neatly solves both difficulties.

As soon as you complete the edit process and Explorer writes the updated .PIF or .LNK file to disk, HotKey Detective detects the change to your file system and automatically rebuilds its hotkey list. This feature uses a separate process, called a *worker thread*, to monitor your file system (more on this later). The worker thread that performs this function consumes almost no processor time while waiting for changes to occur, so it should

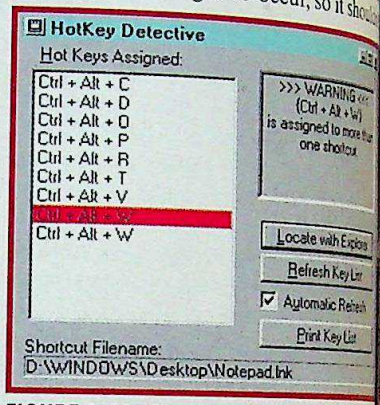


FIGURE 1: *HotKey Detective's main dialog box lists all the hotkeys in use on your system.*

have much impact on your system's overall performance. Once a change is detected, however, the resulting file scan works the disk pretty hard. If you're making extensive modifications to your Start Menu and find that HotKey Detective's constant activity slows your system too much, you can disable this feature by clearing the Automatic Refresh check box. (Note that Automatic Refresh works even if the main window is minimized.) Turning Automatic Refresh back on triggers an immediate refresh. HotKey Detective saves the Automatic Refresh setting at shutdown and restores it the next time you run the program.

The Refresh Key List button tells HotKey Detective to scan your system immediately, whether or not Automatic Refresh is enabled. Note that while a refresh is in progress, the button will be disabled so that you cannot trigger a manual refresh while an automatic refresh is running.

I added this feature because under some unusual circumstances it's possible for HotKey Detective to miss a file change while a refresh is in progress. This happens because of a compromise made necessary by the way Windows reports file system changes. Some actions can cause several change events to occur in rapid succession. For example, moving a shortcut from one folder to another causes four distinct change events: the creation of a new file, a change to the destination folder, deletion of the original file, and a change

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```
UINT Watch_File_System(LPVOID pParam)
{
  // Get pointer to main app object passed through
  // AfxBeginThread().
  CHKDDlg* pThis = (CHKDDlg*) pParam;
  HANDLE hChanges[3] = {NULL, NULL, NULL};
  DWORD wait_status;

  // Make sure main dialog is up to date.
  pThis->OncmdRefresh();
  // Get handle to the Mutex object.
  hChanges[2] = pThis->hmy_mutex;
  while (TRUE)
  {
    // Create handles for the file system changes
    // that we need to monitor.
    // First, changes to files in the Desktop
    // folder only.
    hChanges[0] = FindFirstChangeNotification
    ➥(pThis->desktop_folder,
          FALSE,
          FILE_NOTIFY_CHANGE_FILE_NAME |
                FILE_NOTIFY_CHANGE_LAST_WRITE);
    // Second, changes to files and folders in the
    // entire folder tree rooted at the Start Menu
    // folder.
    hChanges[1] = FindFirstChangeNotification
      ➥(pThis->start_menu_folder,
          TRUE,

          FILE_NOTIFY_CHANGE_FILE_NAME |

          FILE_NOTIFY_CHANGE_DIR_NAME |

          FILE_NOTIFY_CHANGE_LAST_WRITE);
    // Enter infinite wait; Windows will
    // tell us when any
    // of the specified events occur.
    wait_status = WaitForMultipleObjects(3, hChanges,
      ➥FALSE, INFINITE);

    // Close the file system wait handles.
    FindCloseChangeNotification(hChanges[0]);
    FindCloseChangeNotification(hChanges[1]);
    // If the wait function didn't fail,
    if ((wait_status < WAIT_ABANDONED_0) &&
    ➥(wait_status != WAIT_FAILED))
    {
        // See which object satisfied its wait
        // condition.
      if ((wait_status - WAIT_OBJECT_0) == 2)
          // If it was the Mutex object,
          // shut down.
        break;
      else
      {
          // Otherwise, make sure the main dialog
      // isn't busy.
        while (!pThis->m_cmdRefresh
        ➥.IsWindowEnabled())
            Sleep(100);
          // Then tell it to update.
        pThis->OncmdRefresh();
      }
    }
    else
    {
        // If the wait function failed,
        // terminate ourselves and
        // make sure the main app knows we're
        // not running.
      pThis->m_chkAutoScan.SetCheck(0);
      pThis->my_thread = NULL;
      break;
    }
  }
    // Relinquish ownership of the Mutex
    // object.
  ReleaseMutex(hChanges[2]);
  return 0;
}
```

FIGURE 2: *This is the controlling function for the worker thread.*

the source folder. The system functions that monitor changes cannot report *what* has changed, only that *something* has changed. As a result, when a change does occur, HotKey Detective must reread all the areas of your file system that could be affected.

If the monitor function reacted to each and every one of these changes individually, the program would scan the system from two to six or more times after a single operation (from the user's viewpoint) in Explorer. To avoid this, monitor stops during a refresh operation. It is conceivable that the program could miss a file change while a refresh is in progress, though I have never seen this happen. The manual refresh command exists simply to provide peace of mind.

The Print Key List button does just what it says. When you click the button, you'll see a standard Print dialog in which you select the device on which to print the list. If you click OK, you'll then see the Select Print Size dialog box. The default point size is 10, but you can pick a different size (ranging from 8 to 24) from the drop-down list if you wish. Clicking the Cancel button in either of these dialogs cancels the entire print process.

It is crucial to note that the information shown in Hotkey Detective represents your hotkey settings *as they are stored on-disk*. Explorer's internal hotkey table may not correctly reflect these settings. If you notice that your hotkeys don't activate the same shortcuts that Hotkey Detective displays, don't panic. Simply shut down your computer and restart it. A full restart is required; you cannot use the undocumented "warm boot" feature invoked by holding down the Shift key while selecting Restart Your Computer.

INSIDE HOT KEY DETECTIVE

I wrote HotKey Detective using Microsoft Visual C++, Version 4.0, and the Microsoft Foundation Classes, Version 4.0. If you download the source code, extract the files from the .ZIP archive into their own directory and use the -d option to preserve the directory structure.

To implement Hotkey Detective, I had to solve two main problems. The more important one was determining where and how Explorer stores its hotkey settings. I didn't find them in the Registry, but I did find a clue. Examining Registry settings (under HKEY_CLASSES_ROOT) for the .LNK and .PIF file types, I discovered that Explorer uses two separate handlers: a Context Handler for .LNK files and a Property Sheet Handler for .PIF files. It is these handlers that present the pop-up menu when you right-click on a shortcut, as well as the Shortcut Properties dialog

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```
void CHKDDlg::Launch_Worker(void)
{
    // Create a Mutex object and obtain a handle
    // to it.
    // The TRUE parameter specifies that this process
    // gets immediate ownership of the object.
  hmy_mutex = CreateMutex(NULL, TRUE, NULL);
    // Launch the thread.
  my_thread = AfxBeginThread(Watch_File_System,
                    this,
                    THREAD_PRIORITY_NORMAL,
                    0,
                    0,
                    NULL);
    // If the launch failed, AfxBeginThread() returns
    // a NULL pointer.
  if (my_thread == NULL)
  {
     CloseHandle(hmy_mutex);
     Do_Error_Message("Unable to launch file system
      monitor.");
  }
}
```

FIGURE 3: *Launch_Worker() creates the file-system monitor thread.*

when you select Properties from that pop-up menu. "Aha!" I thought, "The hotkeys must be stored in the files themselves." Microsoft considers the structure of these files to be proprietary information, so I began some detective work of my own.

The basic process was real nose-to-the-grindstone stuff: Make a copy of a shortcut file, change the setting, then compare the two files to see what had been changed (much as I did while writing my last utility, RecEdit). As it turns out, .LNK files hold the hotkey information in two bytes starting at offset 40h from the beginning of the file. The first byte holds the "virtual key" code; the second contains a shift mask indicating which modifiers the key uses (bit 0 representing the Shift key, bit 1 the Ctrl key, and bit 2 the Alt key; bit 3 is used to indicate extended keys, such as the cursor movement keys on the middle section of 102-key keyboards). If the shortcut does not have a hotkey assigned, both bytes will be 0.

Decoding .PIF files was a bit more complicated. To begin with, I found three different flavors of .PIF files on my system, with three different file sizes: 545, 967, and 995 bytes. The shortest ones are old .PIF files from Windows 3.*x*. Whenever I made any change to these .PIF files, Explorer rewrote them with one of the other two file sizes.

I determined that .PIF files hold their hotkey information using three bytes in one of two possible sets of nonconsecutive locations. The first byte (1B5h or 1D1h) is the keyboard scan code. The second byte (1B7h or 1D3h) contains a shift mask in which bits 0 and 1 represent the left and right Shift keys (even though Explorer does not distinguish left and right), bit 2 represents Ctrl, and bit 3 represents Alt. The third byte (1BBh or 1D7h) contains 1 if the key is an extended key, 0 if it is not. I found no correlation between the file size and the offsets used. Some of the longer files had their hotkeys at the lower offsets, and some of the shorter ones had their hotkeys at the higher offsets.

I did notice that the upper four bits of the correct shift-mask byte were always 0, and that the other possible location was always in the middle of a string of ASCII text that contained no control characters (values less than 20h). Therefore, I found I could determine which locations held the settings by the process of elimination. To find the correct set of locations for a particular file, I looked at the two shift-mask offsets and used the set in which the upper four bits were 0. This may seem arbitrary and kludgy, but it works!

AUTOMATIC DETECTION

The next important task to accomplish was to keep HotKey Detective's information current. Windows is a multitasking environment, so it's possible for the user to change hotkey settings, or even completely rearrange the Start Menu and Desktop folders while HotKey Detective is running. I could have left it up to the user to refresh the data manually, but that seemed clumsy: After all, the whole point of having a computer is to have the machine to automate mundane tasks like this. Since there are many different operations that can affect the user's hotkey settings, I had to find a way for HotKey Detective to detect those changes and update itself automatically.

I accomplished this using multiple threading. Whenever Automatic Refresh is turned on (at startup, or when the user checks the Automatic Refresh box), HotKey Detective launches a separate thread that sits in the background and watches for changes to relevant portions of the file system. Specifically, it looks for the following:

- A change to the name or last write date of any file (but not folders) in the Desktop folder. (There's no need to watch subfolders of the Desktop, because Explorer will not use any shortcuts assigned there.)
- A change to the name or last write date of any file or folder in the entire tree rooted at the Start Menu folder.

Since this thread does not require any direct interaction with the user, I created it as a worker thread instead of a user-interface thread. The major difference between the two thread types is that a worker thread does not have a *message pump* (a function required to process standard Windows user-interface messages such as keystrokes and mouse clicks), because it doesn't interact directly with the user. A worker thread is normally used to perform a specific task in the background.

```
void CHKDDlg::Kill_Worker(void)
{
  HANDLE hThread;

    // If thread pointer is not null,
  if (my_thread)
  {
      // get handle to the worker thread.
    hThread = my_thread->m_hThread;
      // Releasing the Mutex object transfers
      // ownership to the the worker thread,
      // signalling it to shut down.
    ReleaseMutex(hmy_mutex);
      // Use thread handle to wait for the thread to terminate.
    while (WaitForSingleObject(hThread, 500) == WAIT_TIMEOUT);
      // Set thread pointer to null.
    my_thread = NULL;
      // Destroy our Mutex object by closing its only handle.
    CloseHandle(hmy_mutex);
  }
}
```

FIGURE 4: *Kill_Worker() terminates the worker thread.*

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THE TOP 10 UTILITIES

1. **STRING** Batch file enhancer
2. **WARPCA** OS/2 file cabinet
3. **APPOIN** Windows appointment book
4. **ZDROP** Drag-and-drop unzipping
5. **FDDLLS** Finds dead DLLs
6. **SPAD** Enhanced Windows Notepad
7. **WINBAR** Taskbar for Windows 3.1
8. **INCTR2** Monitors program installation
9. **WMATCH** Compares directory contents
10. **1MBF** Protects low memory

...ground while the main application continues ...eracting with the user. This task is usually ...ge-ended; that is, it doesn't require any ...t from the user, and once the task is com... ...e, the worker thread terminates itself au... ...matically. Worker threads are often used for ...ks such as a word processor's auto-save ...ction.

HotKey Detective's worker thread is a lit... ...unusual, because its task is open-ended: It ...st continue monitoring the file system until ...e main application tells it to stop. The tricky ...t in designing the worker thread was find... ...an effective method to terminate it from ...thin the main application. This is critical, ...cause your system will suffer from memory ...ks if the worker thread is still running when ...e application's primary thread terminates. ...e worker thread must also be able to com... ...unicate with the main dialog when it detects ...change to the file system. To make all this ...ossible, I declared the worker thread's glob... ...control function, Watch_File_System(), as ...friend of the CHKDDlg class (see Figure 2). ...s you might expect, the control function de... ...rmines what tasks the thread will perform. ...hen the control function returns, the thread ...rminates.

The Launch_Worker() function (see Figure 3) handles the job of starting the worker thread. I begin by creating a *mutex* (mutually exclusive access) object. A mutex object provides a simple, efficient mechanism for synchronizing thread execution, because a mutex object can be owned by only one process at a time. The worker thread passes the mutex handle to the WaitForMultipleObjects() API call. When the main window relinquishes its ownership of the mutex object, this API call signals the worker thread to shut down.

After creating the mutex object and storing a handle (hmy_mutex) to the object so that the worker thread can access it, I call AfxBeginThread() to create the worker thread, specifying Watch_File_System() as the thread's control function. Since I did not specify the CREATE_SUSPENDED flag in the call to AfxBeginThread(), the control function begins executing immediately.

In Watch_File_System(), I call the dialog's OncmdRefresh() function to make sure the dialog is up to date, then set up an array (hChanges[]) of three handles for use by the WaitForMultipleObjects() API function. I set the third element as a copy of the handle to the mutex object created by the parent process, then enter an infinite while() loop.

On each pass of the loop, I set the first two elements in the hChanges[] array as handles to file-system change events. I pass all three handles to the WaitForMultipleObjects() API function. This API function returns when either one of the wait conditions is satisfied or the specified time period elapses. In this case, I set the timeout value to INFINITE to minimize the processor time required. As a result, the worker thread spends the majority of its time in a suspended state, wait-

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ing for the operating system to signal one of the specified events.

When WaitForMultipleObjects() does return, I check its return status. If its value indicates an error condition, I set the my_thread pointer to NULL so that the main process knows the worker thread is not running and then shut down. If the third handle satisfied its wait condition (indicating that the main dialog has relinquished ownership of the mutex object), I break out of the loop and exit the function, terminating the thread. If it was one of the first two handles that satisfied the wait condition, I know the wait function detected a change. As long as a refresh is not already in process, I call the dialog's OncmdRefresh() member function, in effect clicking the Refresh Key List button by remote control. If a manual refresh was already running when a file-system change occurred, I must refresh the dialog a second time, because I don't know whether the directory scan has already passed the area of the disk that has been changed.

When I'm done with the worker thread (which means the user has either disabled Automatic Refresh or closed the dialog), I must shut it down by calling the Kill_Worker() function (see Figure 4). If my_thread is NULL, the thread isn't running, so Kill_Worker() simply returns. Otherwise, I get a handle to our worker thread. This step is critical, because the thread handle is no longer available through the object after the thread terminates.

Next I call ReleaseMutex() to relinquish ownership of the mutex object, signaling the worker thread to shut down. I then pass the thread handle to WaitForSingleObject, which returns when the thread terminates. Finally, I set the my_thread pointer to NULL to let other parts of the program know that the worker thread is no longer running. I destroy the mutex object by closing its handle.

I spent many, many hours working on this program, but it was time well spent. In the process I learned a lot about Windows 95, particularly its powerful multithreading capability. I'm sure you'll find HotKey Detective a useful addition to your utility arsenal, and I hope you have as much fun using the program as I had writing it. □

Gregory A. Wolking is the primary sysop of the Utilities/Tips Forum on ZD Net.

GUIDE TO OUR UTILITIES

ABOUT HOTKEY DETECTIVE...

PURPOSE Windows 95 has support for hotkeys, but it's quirky at best, buggy at worst, and poorly documented. Hotkey Detective lists the hotkeys in use on your system, along with their associated shortcuts, and launches Explorer if you want to make changes. Thus it provides a mechanism for discovering and eliminating duplicate hotkeys, which can create problems on your system.

USAGE To install Hotkey Detective, simply copy it to your hard disk and create a shortcut for it. It does not have to be in your DOS PATH. When you run Hotkey Detective, it scans your Start Menu and Desktop folders and finds the hotkey assignments that Explorer stores in your .LNK and .PIF files. It presents a sorted list of all the hotkeys in use. Because the list is sorted by hotkey name, any items with duplicate assignments will be grouped together. If there are duplicates, Hotkey Detective displays a warning message beside the list and automatically selects the first duplicated key name.

When you select a key name in the list, the full path to the corresponding shortcut appears in the Shortcut Filename box at the bottom of the window. If the filename is too long for the text field, you can resize the dialog and the controls will rearrange themselves appropriately. The Print Key List button lets you print your hotkeys and their associated shortcuts.

To change an assignment, you can either double-click on a key name or select a key name and either click the Locate with Explorer button or press Enter. Hotkey Detective will launch Explorer in dual-pane view, with the shortcut selected in the right-hand pane and the appropriate segment of the folder tree opened in the left-hand pane.

The Refresh Key List button tells the program to rescan your system immediately. The Automatic Refresh check box lets you disable this feature if it bogs your system down. The check box setting is saved automatically when you exit the program.

Explorer is unreliable at updating its internal hotkey table. As a result, you can end up with "ghosted" hotkeys that continue to launch items even after you have removed their assignments, along with keys that continue to launch the wrong items after you have eliminated duplicate settings. To correct this, shut down your system and reboot.

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Quick DOS Access in Windows 95

I have Windows 95 installed on my system, but I'm still a DOS diehard. Happily, I discovered an easy way to launch a DOS session from any folder. Open any folder and select View | Options from the menu. Click on the File Types tab in the Options window, then scroll down the list of Registered File Types and choose Folder. Double-click on Folder or press the Edit command button, then select New. Type "Shell to DOS" in the Action line and type "c:\windows\command.com /K cd" in the "Application used to perform action" line. (Note that the K following the slash must be uppercase.) Select OK and close all windows.

You have now added "Shell to DOS" as an option to the right-click menu for folders. When you select this option, Windows 95 launches a DOS session with the active folder as the current directory.

DOUGLAS CLINE, *via the Internet*

PC MAGAZINE: Many of us have survived version after version of DOS, learning the arcane syntax for dozens of powerful DOS commands. When we need to manipulate files, we reach for a DOS box. Adding this handy item to the right-click menu for Windows 95 folders puts these commands just a mouse click away.

Of course, if your Windows 95 directory is not "c:\windows," you'll have to substitute the correct directory. In fact, in most cases you can just use "command.com /K cd". The defined purpose of the /K switch is to execute the command that follows and leave command.com running. In this case, it simply serves to suppress the multiline Microsoft copyright notice that would otherwise be displayed.

Another Hidden Windows Keyboard Shortcut

I just saw the item in the column of January 23, 1996, about keyboard shortcuts in File Manager. Under Windows 3.x, as well as any old-style dialog boxes still found in Windows 95 (like the Install New Fonts dialog in Control Panel's Fonts applet), Ctrl-<Slash> selects every file on the list. This must be one of the least documented, most useful shortcuts in history. It's very annoying that nothing like this exists in the new common dialog boxes.

ED MENDELSON, *via ZD Net*

PC MAGAZINE: The Ctrl-<Slash> keyboard shortcut is actually part of the keyboard interface for any multiple-choice list box. List boxes, like push buttons, check boxes, and edit boxes, are user interface elements built into Windows itself. In Windows 3.*x*, the common dialogs use a list box to hold filenames, and thus the Ctrl-<Slash> keystroke works. List boxes are present in Windows 95 as well and, as Mr. Mendelson noted, they still support the Ctrl-<Slash> shortcut.

In Windows 95, however, the common dialogs use a more advanced control, called a list view. This control can display the file list in a number of different ways, including the icon associated with each file. It does not implement the Ctrl-<Slash> keyboard shortcut, however. Many programs, including Explorer, do, however, use Ctrl-A to select all files in a list in Windows 95. Without leaving the Windows 95 file common dialog, you can rename a file or create a new directory. One click chooses between a file-and-icon list and a list with complete details. And clicking on any column heading in the details list sorts by that column. These added features surely outweigh the loss of the Ctrl-<Slash> shortcut!—*Neil J. Rubenking*

Fastest Windows 95 Restart

Regarding the User-to-User column of February 6, 1996, the methods described for restarting Windows 95 are okay, but if you really just want to restart Windows without rebooting, it's fairly easy.

Click on Start and select Shut Down. Select "Restart the Computer?" from the dialog box and then, while holding down the Shift key, click on Yes. Windows 95 will restart without rebooting the PC. Note that you should hold down the Shift key until the screen goes blank, then let it up. Otherwise, Windows will stay in limbo until you release it.

BOB ROUSE, *Lilburn, GA*

HIGHLIGHTS



HARDWARE If your printer doesn't have a page-eject button, don't despair: There is a software solution that serves the same function. *Page 93*



DATABASES Microsoft Access offers no built-in spinner controls, but there is a way to simulate them on your own. We tell you how to do it and what the advantages are. *Page 95*



GRAPHICS Find out what premastering software is and why you'll need it if you want to make high-quality recordings on CDs. *Page 97*

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PC MAGAZINE: *PC Magazine* has well over a million readers, and it seems that about half of them wrote to me about this faster method for restarting Windows 95. Until this letter arrived, however, I had the impression that the Shift key technique for restarting Windows 95 was unreliable. In fact, I was simply failing to hold down the Shift key long enough. I have yet to find a system that doesn't restart successfully when you hold down the Shift key until the screen goes black and the words "Windows is now restarting" appear on the screen.

Just how much time you'll save depends on your system, but chances are good that you'll get Windows 95 restarted in about half the time it would take to reboot. Not only that, but if you use an operating system loader like System Commander or the Windows NT Boot Loader, the Shift key restart bypasses it and goes directly back into Windows 95.

The Windows 95 Easter Egg

In the Tutor column of December 19, 1995, Jeff Prosise mentioned a hidden feature in Windows 95: An animated, music-accompanied display of the Windows 95 Product Team's credits will be shown if you precisely follow a lengthy, error-prone procedure. The feature is disabled, though, once you exit and restart Windows 95. To reenable it, you have to repeat the entire procedure.

I tried to create a batch file to automate the task of creating and renaming the folder, but I couldn't get it to work; it seems that keystrokes must be fed manually to the Windows shell in order to trigger the hidden feature.

Because the Windows Recorder can record and play back keystrokes, I recorded a macro of the entire procedure, then played it back. The macro worked fine, just as if I'd entered the keystrokes manually.

KEVIN YIP, *Flushing, NY*

PC MAGAZINE: The Windows 95 "Easter egg" has been the subject of much debate. Some readers want a better, faster way to show the credit screen. Others resent the fact that disk space and processing power are devoted to this frivolous activity and want to get rid of it.

Mr. Yip's Recorder solution should satisfy the first group. Those who lost RECORDER.EXE by letting Windows 95 completely replace Windows 3.1 can surely find a copy. PC Magazine Online offers the file EASTER.REC for download. This is a Recorder macro file that has been cleaned up and streamlined using our RECEDIT utility. Close or minimize all open programs to give the macro access to the desktop, then load EASTER.REC [illegible] Recorder and run the single macro it contains.

Microsoft confirmed that the only way to hatch the Easter egg is by performing the elaborate ritual of creating and renaming a folder, either by hand or by using an equivalent macro. A batch file won't do the job, but will any program that calls on DOS or Windows functions to create and rename the special folder.

As for those who despise the frivolous waste of resources, I checked with Microsoft to see just how much is consumed. Various [illegible] within SHELL32.DLL indicate whether the naming ritual has been performed. The variables use a piddling 8 bytes of memory. The code that creates the credits folder is under 2K, and it resides in memory only while the credits are running. And the MIDI file that provides the background music is compressed to under 8K and stored inside SHELL32.DLL. When the Easter egg is invoked, this file is decompressed and stored as the 36K CLOCK.MID in the Media directory below the main Windows 95 directory. You can freely delete the file, but it will be re-created if you display the Easter Egg again.

In short, if you never invoke the Easter egg, it uses roughly 10K of disk space and absolutely no memory. There's no way to remove it from your system *completely,* but the cost is [illegible]

We at *PC Magazine India* are doing our utmost to meet your expectations. To demonstrate just how much we care for your views and sentiments, we invite you to send us your frank comments on the magazine. Your free and forthright comments will help us serve you better.

If you have any concrete suggestions that you feel will help us improve the quality of the magazine, please do not hesitate to write to us. We will be grateful.

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Ask Our Advisors

HARDWARE

No-Button Blues

I have an excellent ink jet printer, but it lacks one feature: a page-eject button. If I print only a few lines with some programs, the printer won't spit out the page. Jogging on the wet sheet or sending a string of line feeds are not practical solutions, so I wrote a 20-byte program using DEBUG that sends an eject character to the PRN device. It's so handy that I've even created an icon for it in Windows.

ZOLTAN KOVACS,
Sault Ste. Marie, Ontario, Canada

PC MAGAZINE: In an effort to simplify their printers, manufacturers have been cutting back on nonessential controls. Whether or not a form-feed button is nonessential is certainly open to debate, but clearly it's useful to have a software solution to the problem. If you're handy with DEBUG's MOV and XCHG commands, you can indeed create such an executable program, but most users aren't this adept at programming.

You might be tempted to use the DOS ECHO command to send a form-feed character to the printer. This potential solution has the undesired effect of adding a Carriage Return/Line Feed combination at the end, resulting in a blank line at the start of your next print job (or a blank-page ejection, if your printer driver sends a printer reset command before printing, as many drivers do).

Fortunately, two equally small files can give you your form-feed function without requiring advanced programming or partial solutions. The first step is to put the form-feed command into a text file. For most printers, the command is the ASCII 12 character (created by typing Ctrl-L). Create a file named EJECT by typing COPY CON EJECT at the DOS prompt and pressing Enter. You'll get a blank line. Press Ctrl-L, then Ctrl-Z (the DOS end-of-file character), and then Enter. DOS will respond with the message "1 file(s) copied."

Now create a batch file—call it PEJECT .BAT—by typing COPY CON PEJECT.BAT at the DOS prompt and pressing Enter. At the blank line, type COPY d:\path\EJECT LPT1 (assuming your printer is connected to LPT1) and press Enter. Then type Ctrl-Z and press Enter again to create the file. If you want the file to work from any directory in your system, save the batch file in a directory on your DOS PATH and be sure to specify the correct drive letter and complete path for the EJECT file in PEJECT.BAT.

EJECT will work with any PCL-compatible and most dot matrix–compatible printers. If you have a PostScript printer, however, you'll need a different command in the EJECT file. Instead of using Ctrl-L, type SHOWPAGE and press Enter before you type Ctrl-Z and press Enter to save the file.

You can create an icon for PEJECT.BAT in Windows and make it easy to eject a partial page from just about any printer, even if it does have a form-feed button.—*Alfred Poor*

OPERATING ENVIRONMENTS

Sequential Numbers in A Batch File

Is there a way to have a batch file change directories in sequential order, starting with the number 7,000, repeatedly executing the same set of commands in each directory? I have about 600 directories I have to process, and I'd like to be able to do

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```
@ECHO OFF
:: -- Set starting value
:: -- M=thousands, H=hundreds, T=tens,
O=ones
:: -- This example starts at 7000
SET M=7
SET H=0
SET T=0
SET O=0
:Loop
:ReturnM
ECHO Directory is %M%%H%%T%%O%
(put ECHO commands here)
:: -- Replace '7600' in next line ➥with
ending value
IF '%M%%H%%T%%O%'=='7600' GOTO
➥OutOfLoop
SET Place=O
GOTO Inc
:ReturnO
IF NOT '%O%'=='0' GOTO Loop
SET Place=T
GOTO Inc
:ReturnT
IF NOT '%T%'=='0' GOTO Loop
SET Place=H
GOTO Inc
:ReturnH
IF NOT '%H%'=='0' GOTO Loop
SET Place=M
GOTO Inc

:Inc
IF '%Place%'=='O' SET Value=%O%
IF '%Place%'=='T' SET Value=%T%
IF '%Place%'=='H' SET Value=%H%
IF '%Place%'=='M' SET Value=%M%
IF '%Value%'=='0' SET %Place%=1
IF '%Value%'=='1' SET %Place%=2
IF '%Value%'=='2' SET %Place%=3
IF '%Value%'=='3' SET %Place%=4
IF '%Value%'=='4' SET %Place%=5
IF '%Value%'=='5' SET %Place%=6
IF '%Value%'=='6' SET %Place%=7
IF '%Value%'=='7' SET %Place%=8
IF '%Value%'=='8' SET %Place%=9
IF '%Value%'=='9' SET %Place%=0
GOTO Return%Place%

:OutOfLoop
FOR %%v IN (O T H M Place Value) DO ➥SET
%%v=
```

FIGURE 1: *This batch file "counts" the numbers from 7,000 to 7,600.*

it without having to run the same batch file 600 times.

MICHAEL SHANNON, *via ZD Net*

PC MAGAZINE: Batch files have no built-in math abilities, so the basic problem here is getting a batch file to count. The solution is to break down the problem into simple rules that can be expressed in a batch file. For example, a batch file can't calculate the digit that follows a given digit, but a series of ten IF tests can process each possible digit individually. NUMDIRS.BAT (Figure 1) uses this technique and leverages it into a method for adding 1 to a multidigit number.

The batch file starts by defining environment variables O, T, H, and M to hold the ones, tens, hundreds, and thousands digits. In this case, we want to start with the number 7,000, so the batch file sets the thousands digit to 7 and the other three to 0. Now a loop begins that will repeat many, many times. The example batch file simply displays the current number. In practical use it would include instructions to be performed within a directory whose name corresponds to that number.

After processing the directory corresponding to the number stored in the four single-digit environment variables, the batch file must add 1 to the number. First, it sets the environment variable Place to O, the name of the variable holding the ones digit. It jumps to the label Inc, which holds code to increment a digit. The initial value is set to the digit contained in the variable named by the Place variable. Then one of the ten IF tests mentioned earlier sets that digit to the next greater digit. Finally a GOTO command jumps to the label "Return%Place%". When the batch file runs, the string %Place% is replaced by the value of the Place variable, so this first time the GOTO jumps to the label ReturnO.

At the ReturnO label, the batch file checks whether the ones digit is zero. If not, control goes back to the top of the loop and another directory gets processed. But if the ones digit is zero, the batch file needs to increment the tens digit. The process for incrementing the tens digit is precisely the same, except that the Place variable is set to T, the name of the variable holding the tens digit. When the string formed by joining the four digits equals 7,600 (the reader's specified stopping point), an IF test near the beginning of the batch file jumps out of the loop. You can use variations on this technique to devise counting batch files of your own.—*Neil J. Rubenking*

WORD PROCESSING

Inserting Logos and Letterheads in WordPerfect Files

In the Solutions column of October 24, 1995, you described how to use master documents or merges to reduce the size of WordPerfect files containing graphics. Your suggestions are useful, but there is another solution worth mentioning: the Graphic on Disk option. This lets the user see and print the document exactly as it will print. The graphic is not saved with the document you save, but the reference to the graphic's location on disk is.

FRANK BILLINGTON, *via CompuServe*

PC MAGAZINE: The original question posed in the October 24 issue was how to add both a logo and letterhead to a letter without having to save duplicate copies with each letter. As I said in my original response, there are at least two ways to do this: with master documents and merges. Enough readers wrote in suggesting the Graphic on Disk option that it warrants a look.

The Graphic on Disk option, which retrieves the graphic from a file on disk while storing it in the document, is available in both WordPerfect for Windows and WordPerfect for DOS back to at least Version 5.1. The steps for using it, however, vary slightly from one version of WordPerfect to another. Some versions refer to the option as Graphic on Disk and others call it Image on Disk. To keep the discussion simple, I'll describe only the steps for WordPerfect for Windows 6.1.

To insert a graphic stored in a different file, simply choose Graphics Image to open the Insert Image dialog box, make sure there is an X in the Image on Disk check box, then select the file and choose OK. WordPerfect will insert the image in your document and let you move and manipulate it just as if the file were stored in the document itself.

I ignored this approach in my original response, because it will only let you insert one graphic. You can insert a logo in each letter without having to save it, but you still have to re-create and resave the text of the letterhead in each letter. Another strike against this option is that it doesn't save as much disk space as the other options.

In the October issue I ran some tests with a logo-plus-letterhead file of 15.7K. Inserting the file in a master document with one line of text using the merge command yielded a file just over 1K. Inserting the file using a master document and condensing it gave me a file of 2.5K. Creating the same letter using the Image on Disk option but re-creating the letterhead text gave me a 3.5K file. So both the merge and master document methods save more disk space than the Image on Disk option.

Note too that while Mr. Billington is correct that the Image on Disk option will let you see and edit the document exactly as it will print, you get the same advantage from master documents. The one clear advantage of the Image on Disk option is that it's somewhat easier to use than either of the other two choices. That is, if you don't count the extra work of re-creating the letterhead in each letter.—*M. David Stone*

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SPREADSHEETS

YTD Formulas in Multisheet Workbooks

Microsoft Excel's multisheet workbooks seem as if they'd be ideal for calculating year-to-date values, but Excel makes it surprisingly difficult to enter year-to-date formulas. For example, assume you have a workbook with sheets named Jan, Feb, and so on through Dec. Assume also that on each sheet, some cell—say, C4—has a monthly value, and that below that on each sheet you want the YTD value.

On the Feb!C5, you enter the formula =Jan!C5+C4. If you copy this formula to cell C5 on each of the remaining sheets, Excel does not treat the reference to the January sheet as a relative reference. Instead of giving you Feb!C5+C4, =Mar!C5+C4, and so on, it simply makes each copied formula reference the same January cell.

The macro in Figure 2 uses Excel's Replace command to fix this problem. It uses SpecialCells(xlLastCell) to select the entire populated region of each worksheet, and on each sheet it gets the replacement value for Jan from the name of the previous sheet. This assumes, of course, that the sheets are arranged in ascending-month order. The macro is otherwise general, however; it is not necessary that the first month be January or even that there be 12 sheets.

MICHAEL TROMBETTA, *Manhasset, NY*

PC MAGAZINE: The reason Excel doesn't treat Jan! as a relative reference is that Excel isn't a truly three-dimensional spreadsheet. It's one of Version 7 (Excel for Windows 95), the program handles cross-sheet references within a workbook the same way it handles references to cells lying outside the workbook altogether; that is, it treats them as absolute. Mr. Trombetta would not experience the same problem creating YTD formulas in either Lotus 1-2-3 (Release 3 or later) or Quattro Pro.

The macro submitted by Mr. Trombetta is one way to work around Excel's clumsiness. Two others are shown in Figure 3. All of them are available from PC Magazine Online in the file CORYTD.TXT. See the sidebar "Guide to Our Utilities," in this issue's Utilities column, for downloading instructions.

YTD is a custom function that simply totals the values in a particular cell position on all sheets beginning at the workbook's first sheet and ending at the current sheet. For example, if you call the function with

```
=YTD(C4)
```

on your May worksheet, the function returns the sum of Jan!C4, Feb!C4, and so on through the May worksheet.

YTD just returns a number, and without reviewing the code behind the function, you can't tell how the number was derived. The BuildFormula macro, by contrast, constructs a formula like this:

```
=SUM(Jan:May!$C$4)
```

so you can see where your YTD numbers are coming from. When you run the macro, a dialog box prompts you to type a cell reference or point to a cell. The cell (or range) you name is then plugged into the resulting SUM formula.

Note that this macro is less general than Mr. Trombetta's. It assumes that the sheets you want to tally begin with Jan. If your fiscal year starts in some other month, just substitute the name of that month in the line immediately before End Sub.—*Craig Stinson*

```
Sub CorrectYTDCalc()
  Dim FirstName As String, ReplaceName As String
  Dim N As Integer

  FirstName=Worksheets(1).Name
  FirstName=FirstName & "!"

  For N = 3 to Worksheets.Count
      Worksheets(N).Activate
      ReplaceName=Worksheets(N-1).Name
      ReplaceName=ReplaceName & "!"
      Range("A1", _
Range("A1").SpecialCells(xlLastCell)).Select
Selection.Replace _
What:=FirstName, replacement:=ReplaceName
  Next N
End Sub
```

FIGURE 2: *This Excel macro fixes cumulative references to the previous sheets in a workbook, letting you insert YTD formulas in a workbook of monthly spreadsheets.*

```
Function YTD(CellRef) As Double
  Dim rw As Integer, cl As Integer, idx.As Integer
  rw = CellRef.Row
  cl = CellRef.Column
  For idx = 1 To ActiveSheet.Index
    YTD = YTD + Worksheets(idx).Cells(rw, cl).Value
  Next
End Function

Sub BuildFormula()
  Dim CellRef As Range
  Dim Address As String

  Set CellRef = Application.InputBox(prompt:= _
    "Click on a cell or type the reference", _
    Title:="Which cell do you want in the sum?", _
    Type:=8)
  Address = CellRef.Address
  ActiveCell.Formula = _
 "=SUM(Jan:" & ActiveSheet.Name & "!" & Address & ")"
End Sub
```

FIGURE 3: *The YTD custom function and the BuildFormula macro shown here are alternative solutions to cumulative sheet references.*

DATABASES

Simulating Spinners in Microsoft Access

Here's how I simulated a spinner control on a form in Microsoft Access. I had a control named Number whose value I wanted to increment and decrement. To the right of that control I placed a command button named RightArrow with a right arrow as its picture. I set RightArrow's AutoRepeat property to Yes and placed the following code in its Click event:

```
Sub RightArrow_Click ()
 Me![Number].SetFocus
 Me![Number] = Me![Number] + 1
 Me![RightArrow].SetFocus
End Sub
```

I duplicated this logic on the left side by creating a command button called LeftButton to the left of the Number control. I set its AutoRepeat property to Yes and placed this code in its Click event:

```
Sub LeftArrow_Click ()
 Me![Number].SetFocus
 Me![Number] = Me![Number] - 1
 If Me![Number] < 0 Then
  DoCmd Beep
  Me![Number] = 0
 End If
 Me![LeftArrow].SetFocus
End Sub
```

That completes my spinner. It has all the typi-

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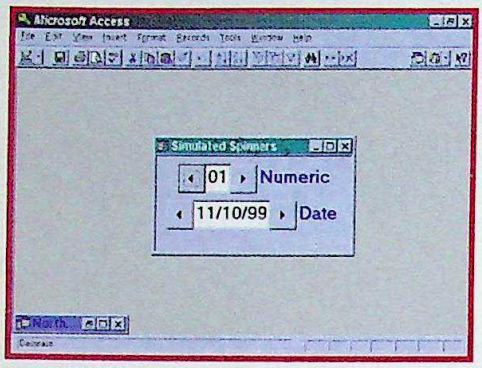


FIGURE 4: *You can simulate spinner controls in Microsoft Access by creating arrow buttons and attaching the appropriate code to their On Click events.*

cal attributes of a spinner and includes a minimum value check. You can also set a default value by setting the Number control's default value property.

I like this better than an OCX spinner, especially for distributed applications, as obviously there are no OLE problems with it. In addition it is not limited to preset data types, preset ranges, or preset intervals, as many spinners are.

LYLE FAIRFIELD
Puslinch, Ontario, Canada

PC MAGAZINE: Figure 4 shows sample numeric and date spinners that I created using a technique similar to Mr. Fairfield's. A spinner is a control that saves you from having to directly input a number or a date (or theoretically any type that can be incremented or decremented). Instead, you simply click on the nearby up or down arrows to alter the value.

Spinners are not among the built-in form controls in Access 2.0 for Windows or Access for Windows 95. If you purchase the Access for Windows 95 Developer's Kit, however, you'll find that it includes a spin button OLE custom control that you can use with your Access applications. The advantage of simulating a spinner on your own instead of using an OLE custom control is that you can customize the appearance of the spin buttons to your liking. The performance characteristics of some OCXs may also make it advantageous to code your own spinners, and in doing so you avoid any OCX distribution issues.

Mr. Fairfield's technique is to set the focus to the control being altered, adjust its value, and then return focus to the spin button. While this works fine, you'll find that setting the focus isn't absolutely necessary. That is, if you don't set the focus to the control being altered, you can still click on one of the arrows to adjust the control's value. The only problem with this is that when you hold down the mouse button to spin rapidly, Windows has a tough time keeping up with the changes, and your control won't repaint quickly enough. So instead of seeing the updated value after every increment, you'll see it only when Windows manages to catch up. This makes it difficult to know when to release the mouse button.

Setting the focus back and forth between the control being changed and the spin button effectively alleviates this problem, but you notice a slightly annoying flash as the focus moves between controls. Another effective approach is to skip setting the focus and instead insert a DoEvents statement after you change the value. This passes control to Windows until Windows can completely process all pending events and avoids the SetFocus flicker. In this case, the RightArrow_Click code becomes:

```
Sub RightArrow_Click ()
 Me![Number] = Me![Number] + 1
 DoEvents
End Sub
```

Because spinner controls have many uses, it makes sense to put together a few standard spin routines to avoid duplicating a lot of code. Figure 5 shows a SpinNumeric procedure that can be used to spin numbers. You pass it the name of the control whose value you want to change, the amount by which to change it, and a minimum and maximum value. For example, to spin a number within a range from 1 to 99, the On Click event code for the right and left arrows might look like this:

```
Sub RightArrow_Click ()
Call SpinNumeric(Me![Number],1,0,99)
End Sub

Sub LeftArrow_Click ()
Call SpinNumeric(Me![Number],-1,0,99)
End Sub
```

```
' Public Sub SpinNumeric(ctl As Control, intIncrement As
' Integer, _
'  intMin As Integer, intMax As Integer)
'
' ctl - The control to spin
' intIncrement - The increment to use
' intMin - The minimum value to allow
' intMax - The maximum value to allow
'*********************************************
************'
Public Sub SpinNumeric(ctl As Control, intIncrement As ➥Integer, _
 intMin As Integer, intMax As Integer)
On Error GoTo Err_SpinNumeric

  If (ctl + intIncrement) >= intMin Then  ' Check Min
   If (ctl + intIncrement) <= intMax Then ' Check Max
    ctl = ctl + intIncrement      ' Spin it
    DoEvents
    Exit Sub
   End If
  End If

  DoCmd.Beep ' Out of range
  Exit Sub

Exit_SpinNumeric:
  Exit Sub
Err_SpinNumeric:
  MsgBox Err.Description
  Resume Exit_SpinNumeric
End Sub

'*********************************************
************
' Public Sub SpinDate(ctl As Control, strInterval As
' String, _
'  intIncrement As Integer)
'
' ctl - The control to spin
' strInterval - The DateAdd interval to use
' intIncrement - The number of intervals to increment by
'*********************************************
************
Public Sub SpinDate(ctl As Control, strInterval As ➥String, _
 intIncrement As Integer)
On Error GoTo Err_SpinDate

  ctl = CVDate(ctl)   ' Make sure it's a date
  ctl = DateAdd(strInterval, intIncrement, ctl) ' Spin it
  DoEvents

Exit_SpinDate:
  Exit Sub

Err_SpinDate:
  MsgBox Err.Description
  Resume Exit_SpinDate

End Sub
```

FIGURE 5: *You can use the SpinNumeric or SpinDate procedures to help simulate spinner controls in Microsoft Access for Windows 95.*

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...when you click on one of the arrow but-
...s, the SpinNumeric procedure is called. It
...ecks to make sure the value that would result
...m the change is within the range specified
...the minimum and maximum values, and if
...goes ahead and changes the [Number] con-
...by the value specified in the second argu-
...ment. If the result would not be within range,
...code beeps and doesn't change anything.

You can also create a simulated spinner con-
...l that adjusts a date value. Figure 5 shows a
...mple SpinDate procedure that you can use to
...ange a date. You pass the routine the name of
...e control whose value you want to change, an
...dication of what interval you want to use to
...just the date, and the number of intervals to
...just with each mouse click. The second argu-
...ment, the interval to use, can be any of the in-
...rvals accepted by Access's DateAdd function.
...For example, to spin a date control named My-
...Date one day at a time, you use "d" for the in-
...erval, and the On Click event code for the right
...nd left arrow buttons becomes:

```
Sub RightArrow_Click ()
Call SpinDate(Me![MyDate],"d",1)
End Sub

Sub LeftArrow_Click ()
Call SpinDate(Me![MyDate],"d",-1)
End Sub
```

The interval argument lets you change "d" ...m" to adjust by one month each click, or ...yy" to adjust by year. You could, for exam-...e, choose to have three "arrow" controls on ...ch side of the MyDate control, where those ...the right increment the date by one day, one ...nth, or one year, and those on the left ...crement by one day, one month, or one year.

You can download the code in Figure 5 ...m PC Magazine Online.—*Sal Ricciardi*

GRAPHICS

Premastering Software

I'm thinking of distributing my multimedia project via compact disk. I know I need a compact disk–recordable drive to create the disk; will I need premastering software as well? Can you explain what this software does and make some recommendations?

ELI KAHAN, *Brooklyn, New York*

PC MAGAZINE: If you want your multimedia ...plication to run reliably on the broadest ...ge of CD drives, you need premastering ...ftware. This software provides two key func-...ons, assuring both the structural integrity of ...e files and cross-platform compatibility.

On the most basic level, premastering software records information from your hard disk to a compact disk. If your system is unable to provide a fast, constant stream of data during the recording process, errors will result. Called buffer-underrun errors, these glitches make the files unreadable. Premastering software helps you to identify potential buffer underruns by performing a dry run of the recording process. The simulated recording differs from an actual recording session in only one way: The CD-R drive's laser is not at full power, in effect disabling the write mechanism. Once you've identified the cause of a buffer-underrun error, you can correct it, typically by changing configuration options (such as data rate or read/write buffer size) within the premastering program.

CD premastering programs also convert your MS-DOS–based files into the ISO 9660 format, which consists of definitions for the file structure and logical organization of a compact disk. Its primary advantage is that it can be read by PCs, Macs, and Unix systems.

In addition to these essential functions, premastering software usually gives you a number of different controls over the recording process. You should be able to choose between single-session, multisession, and multivolume CD formats, each of which is suitable for a particular application. If, for example, you intend to send the master CD out for commercial replication, you must generate a single-session disc. It's also useful if the software can generate mixed-mode disks—that is, a CD that combines digital audio files (CD-DA is the format used for music CDs) with data and graphics (the Extended Architecture CD or the CD-ROM XA format). And although 600-plus megabytes sounds like a lot of storage space, multimedia applications that contain digital video, full-color images, and sound files can quickly exceed the capacity of a compact disk. So you should find a program that offers optimization techniques. For example, reducing the number of tracks on a CD can save a substantial amount of space by eliminating the 2 seconds—or 300K—of blank space typically required to separate tracks.

Now that you understand some of the basic functions offered by premastering software, you're ready to make a choice. If you haven't yet purchased a CD-R drive you may be in luck, because more manufacturers are bundling premastering software with the hardware. But if the bundled software doesn't meet your needs, consider purchasing a separate application. My search turned up four Windows-based programs. All of the programs require a SCSI interface for the drive, and most support only specific models of CD-R drives.

CDR Publisher, from Creative Digital Research runs under Windows 3.*x* and is priced at $495. This program is distinguished by its ability to create hybrid CDs under Windows. The CDs you create with CDR Publisher can contain not only the ISO 9660 format, but Mac HFS and Unix ISO 9660 with Rock Ridge Extension formats as well. This is an essential feature for program developers who want to distribute different versions of a program on a single compact disk. You'll find that though other products can create hybrid disks, they do so only if you're running the Mac version of their software.

Incat Systems, recently purchased by Adaptec offers versions of Easy CD Pro for Windows 3.1, Windows NT, and the Mac. The pricing structure changes depending upon the speed of your CD-R drive. Easy CD Pro for a double-speed recordable CD drive costs $249, while the quad-speed and 6X versions cost $349 and $549, respectively. In contrast to the competition, which supports only specific models of CD-R drives, Incat claims its product is compatible with every SCSI drive on the market.

SimpliCD, from Young Minds Inc. runs under Windows 3.1 and is priced at $284. This product may be of special interest to those using CD-R technology for archiving purposes. An integrated backup and restore utility and support of capaCD (a CD-ROM data compression package available as an add-on option) allow SimpliCD to store up to 4GB of data on a single disk.

The $249 Corel CD Creator, from Corel Corp. is the only program currently shipping a Windows 95 version (in addition to Windows 3.1 and Mac versions). Targeted at the novice user, CD Creator offers a Disk Wizard that essentially walks you through the process of disk layout and creation. CD Creator also offers automated tools to help you create jewel-case inserts. Luisa Simone □

PC Magazine India is the only PC-product evaluation magazine in the country to conform to international standards. It enables you to stay ahead of competition.

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INTERNET COMMERCE:
Doing Business over the Internet

Industry is waiting for a foolproof mode of electronic commerce.

Business via the Internet has not yet become popular in the country. Not even as a concept. In fact, a couple of years ago, only a very few people understood the strange ways of the Internet, and fewer still cared to plunge into its mysterious depths. In India, the reasons for fighting shy of the Internet are manifold. It was only recently that the Videsh Sanchar Nigam (VSNL), the sole body monopolizing overseas communications, started offering Internet access through a number of account categories. VSNL has not particularly excelled in providing quality service or in customer relations. Instead of evoking trust and goodwill, it generates mistrust, resentment, and ridicule. Not many people in the country will submit to the tyranny of the VSNL willingly. What makes the corporation chug along indifferently is compulsion.

At the policy level too, it is not yet clear whether private Internet-access service providers, scheduled to come up in the coming months, will operate from within the stranglehold of the VSNL, or independently. If VSNL continues to rule supreme, rest assured there will be no spurt in Internet-related activities for a long time. Even in the US and Europe, despite the unprecedented explosion in the graphical section of the Internet, commonly referred to as the World Wide Web, commercial exploitation of the medium has been a painfully slow process.

Product management can utilize the Internet as an effective educational and promotional medium, and quite a few companies have done so with encouraging results. From the perspective of the industry, the Internet can be defined as a consumer medium with 40 or more million people ready to listen to your monologue. An interactive channel bringing repeat communication with potential or actual customers can be developed, and the company can get valuable customer information about viewers, as they obtain information about company products. The number of viewers and quality of their experience can be measured.

The Internet is still being studied for legal, regulatory, security, and other crucial aspects. There are problems and they tend to persist. One reason for not embracing the Internet on a pervasive or at least mass scale, is security. The Internet is an open system, and it holds out the possibility that an outside company, may be an arch rival, may be able to track and intercept or change information of an inside corporate system. The problem can be solved, but myths and delusions persist, and nowhere are they more influential than in the corporate sector.

The most important impediment, however, is the absence, or the near absence of, a trustworthy and transparent means of completing a commercial transaction across the Internet. Advertising, education, and providing product information are crucial ingredients of a sales initiative. They all contribute to preparing potential customers for the act of purchase. If, after successfully convincing a viewer that he should buy a product, the company is unable to offer an easy and instantaneous means of effecting the purchase, the initiative is liable to end up in vain. The viewer might move on to a different product, or change his mind. In other words, the Internet will become a true business vehicle only when it offers safe and stable electronic commerce.

To quote Hatim A. Tyabji, CEO, VeriFone, "Banks, credit card companies, merchants, and consumers need a trusted interoperable system as accessible and secure as current payment systems. Consumers need to know they can safely pay for something electronically. Merchants need to know they can safely accept it. Banks and other financial organizations need to be able to process it."

VeriFone and Netscape Communications Corporation recently signed a strategic agreement to jointly create comprehensive Internet payment solutions, enabling merchants, banks, credit card companies, and consumers to expand the use of the Internet for electronic commerce.

VeriFone is a leader in retail electronic payment systems. Netscape is the leading provider of open software for linking people and information over enterprise networks and the Internet. The agreement will thus enhance the acceptance of the Internet as a mainstream vehicle for commerce. Under the terms of the agreement, the two companies will join forces to address the transaction processing needs of both financial institutions and merchants. For financial institutions, Netscape's gateway software and VeriFone's payment technology will be combined to create a seamless interface between the Internet and existing financial networks. VeriFone will also provide customization, installation, and support services for these customers.

To serve merchants, VeriFone will resell Netscape server and commerce products bundled with VeriFone payment functionality to deliver complete software solutions for merchants who want to broaden their reach by establishing a commercial presence on the Internet. VeriFone will provide merchants with these solutions through its existing customers and channels. Netscape and VeriFone create a combination that is trying to fulfill the promise of global electronic commerce. VeriFone's point-of-sale systems for on-line payment processing and credit card verification are among the standards recognized by thousands of banks, credit and debit card processors, millions of merchants and consumers throughout the world. VeriFone's solutions address the technology standards, payment methods and government regulations in over 90 countries around the world, enabling the two companies to accelerate their goal of deploying Internet payment systems worldwide.

According to James Barksdale, CEO, Netscape, "Netscape's agreement with VeriFone will bring a comprehensive Internet payment solution to merchants, banks, credit card companies, and consumers, accelerating electronic commerce worldwide. By combining VeriFone's electronic payment technology with Netscape's complete line of server and commerce software products, financial institutions and merchants can implement a complete payment solution.

VeriFone has also struck an alliance with Oracle corporation to build an Internet gateway for financial institutions. While VeriFone will provide payment processing software, Oracle will lend its WebServer for the purpose.

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PC CARDS: Small Is Powerful and Versatile

PC cards are redefining the frontiers of mobile computing.

Most of you have heard the term PCMCIA, but will probably fail to recollect in what context. The Personal Computer Memory Card International Association (PCMCIA) is a standards body and trade association of about 500 companies including manufacturers of semiconductors, connectors, peripherals and systems, as well as basic input/output system (BIOS) and software developers. The aim of PCMCIA is to provide universal, non-proprietary expansion capability to notebook computers, personal communicators, and other portable computer systems.

The key challenge facing designers of mobile computers is to add functionality such as connectivity, memory and mass storage, while reducing the size and increasing the ruggedness of the package that contains it. Successful product solutions must be flexible and adaptable, while also fully compatible with the range of peripherals and software that users might reasonably expect to incorporate into their systems. While seeking new architectures, designers have sought a standard approach that will allow more hardware and software to work together, lowering the cost of entry for both users and developers, and ensuring against obsolescence for unsupported systems and components. This reliance on standards is an industry practice that covers virtually every element of desktop computing from disks and displays to operating systems, networking, and bus structures.

The most spectacular achievement of PCMCIA is the development of PC cards—a key technology for adding memory, storage, and input/output (I/O) capabilities to portable systems. PC cards offer large data storage and I/O capability, networking, modem, and other functions with low power consumption and fast data access speed in a compact size measuring the length and width of a credit card. They augment or replace traditional memory, mass storage and I/O devices with removable boards that contain one or more integrated circuits. PC cards feature on-card functions or interfaces to external devices. Because they are removable, they let the user expand the memory, storage, communications, and other capabilities of his computer without opening the case.

PC cards come in three standard sizes—Type I, Type II, and Type III. All the types have the same length and breadth. They differ only in thickness. Type I, Type II, and Type III cards are 3.3 mm, 5.0 mm, and 10.5 mm thick respectively. Type I cards are used for memory enhancements, including RAM, flash memory, one-time programmable (OTP) memory, and electronically erasable programmable read only memory (EEPROM). Type II cards are used for memory enhancements and I/O features like data/fax modems, LANs, and host connections. Type III cards is used for memory enhancements and I/O features that require a larger size, such as removable hard disk drives and radio communication devices.

The combination PC card hardware, card, and socket services software provides a plug-and-play (PnP) capability in the portable computing environment. Once the software has been installed, it is possible to add and remove PC cards without powering off the system or opening the covers of the PC system unit. For example, it is possible to insert a modem PC card to access another computer system, download information into the portable computer's memory, remove the modem PC card, replace it with a flash memory card, and store the downloaded information. And you can do all this while your portable computer is running.

As PC cards are added and removed, it is no longer necessary to worry about what memory blocks, I/O ports, or interrupt levels are available. Card and socket services software can configure the system automatically. PC cards provide flexibility of adding the necessary features after the base system has already been purchased. PC card slots can be added to desktop systems as well. The same PC card can operate on all these machine types, with the appropriate card and socket services software.

A range of technologies has come together to fuel the explosion in the mobile computing market. Notebook computers are a viable alternative to desktop computers for mobile users. Pen computing can do away with keyboards for many users, making smaller form-factor computers more practical. Infra-red and radio-based communications allow users to communicate across a room or across a country without having to be connected through wiring. Smaller and smarter microprocessors allow mobile computers to handle more data quicker than ever before. New battery technologies and power management software standards allow mobile computers to function for longer periods of time on a single charge.

The control and interrupt signals in the interface allow modems, LAN cards, mass storage, docking stations, and other peripherals to be built-in the same form-factor.

Dual voltage operation allows designers to build a PC card that drops the system to 3.3 V operation, saving battery power and extending battery life. Execute-in-place (XIP) capability allows operating system and application software to run from ROM or flash memory on the PC card. That contrasts to typical approaches that must first load programs into system RAM, eliminating the need for large amounts of RAM.

Socket services software provides a BIOS-level software interface that isolates other software from the underlying hardware. It identifies how many sockets are in the system and detects the insertion and removal of PC cards while the system is running. Device drivers written for specific I/O cards will run on any system supporting socket services.

Card services software allows the automatic allocation of system resources. Hot insertion and removal is supported when a PC card is inserted or withdrawn while the system is powered on. To accomplish this, the power and ground contact pins are the longest contacts, ensuring that data and disconnect signals disengage first, preserving data integrity. Versatile PCMCIA software standards allow PCMCIA support to be provided for different CPUs, adapters, PC cards, and operating systems. PCMCIA software also allows for PC card compatibility across host systems. The information on the card can be used by host software to correctly configure it for proper operation in the post system.

—Hirendra Chatterjee

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MARKET

HCL-HP Pins Hope On PA 8000 Systems

New Delhi-based HCL Hewlett-Packard (HCL-HP), India's number one IT company and a part of the Rs 15 billion HCL group, has announced its technology strategy for the future.

The strategy banks heavily on HCL-HP's 64-bit RISC processor-based systems, scheduled for release in the coming months. These systems are based on HP's precision architecture (PA), and are being designed specifically for enterprise-wide solutions involving applications in banking, manufacturing, power, and infrastructure.



Larry R. Inman.

Larry Inman, manager (advanced technology marketing, computer systems organization) HP, says, "HP has undertaken implementation of the 64-bit RISC processor in a phased manner, with an eye on Unix and applications. The launch of PA 8000 is a milestone in HP's strategy of providing a complete 64-bit RISC processor-based solution. PA 8000-based systems are capable of performing over 700 transactions per second, which is over two times that of the existing HP systems. It ensures that today's applications will enjoy the benefits of high performance. It will also enable HP systems to support the emerging 64-bit open system standards."



Ajai Chowdhury.

Ajay Chowdhury, president and CEO, HCL-HP, adds, "Our joint venture with HP makes us the best placed IT company to deliver state-of-the-art technology to the Indian customer. With the PA 8000 processor, existing HP systems can be upgraded to run complex technical applications without compromising on past investment or quality."

HP and Intel have collaborated for R&D on 64-bit microprocessor architecture, semi-conductor processes, and optimum utilization of available software.

Microsoft Announces ActiveX SDK

US-based Microsoft Corporation has announced a development kit designed to assist Internet and intranet solution developers. Called Microsoft ActiveX, the development kit provides extensive information on using Microsoft tools for Internet and intranet application development.

"The ActiveX Development Kit is the fastest and easiest way to kick off development of Internet solutions," says Bob Muglia, VP (developer tools), Internet platforms and tools division, Microsoft. "Most important, it provides real-life solutions showing ways in which developers can add value to the Web with Microsoft ActiveX Technologies."

The ActiveX development kit contains more than 600MB of Internet information and products, including the Microsoft Internet Information Server (IIS), a comprehensive sample application, help files, Windows NT 3.51-based updates to support IIS, and a software development kit (SDK) for Microsoft ActiveX Technologies.

The product's documentation helps developers take advantage of the Internet, and access updated information and samples on Microsoft's Web site.

The CD-ROM version of ActiveX is scheduled to be available soon. Current Microsoft Developer Network Level 2 and Level 3 members will receive the Microsoft ActiveX development kit as part of their membership.

The ActiveX SDK also contains a fully functional order-entry application using Microsoft Internet Explorer version 2.0, the Internet Database Connector, Microsoft SQL Server, and Microsoft Access for Windows 95. The order-entry application illustrates ways to activate the Internet with Microsoft technology. ActiveX also provides information about Microsoft Internet Explorer version 3.0.

The software development kit will be of great help to Internet programmers.

ISDN Remote Access Products Launched

Ramco Systems has announced the launch of Xylogics' remote access products in India. Xylogics, a leader in remote access products with a market share of 22.6%, is now part of Bay Networks, a leading networking solutions provider.

Remote access technology enables a remote or mobile user to work on the corporate network and access critical business information and mail over digital and integrated services digital network (ISDN) lines. Corporations that use remote access have the competitive advantage of giving employees immediate access to critical information wherever they might be. With remote access technology companies can provide better response and support to their customers as well as promote better corporate communication within the company.

Says Adam Judd, business manager, Xylogics, "The worldwide remote access market will be US $2 billion by 1998. And this explosion is fueled by the fast growing Internet market. The Nautica ISDN and Remote Annex range of products from Xylogics offers solutions for telecommuting and Internet access. Xylogics products are also being offered by leading OEMs such as IBM, Siemens, AT&T, NCR, and Sequent in the global market."

S. Parameswar, GM (datacom), Ramco Systems, adds, "With ISDN services becoming available in India shortly, and with improved telecom infrastructure, India will see a boom in the remote access market. The demand will be addressed by Ramco Systems through the Xylogics product range."

Ramco Systems is part of the Rs billion RAMCO group, which has a strong presence in cement, textiles, and information technology. Ramco Systems offers complete business solutions comprising enterprise management software and enterprise networking solutions. It is also a distribution partner of Bay Networks in India.

PLEASE SEND YOUR COMMENTS ON THE INDIAN SECTION TO THE EDITOR

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Lucent Bags Escotel Contract

New Delhi-based Escotel Mobile Communications, a joint venture between Escorts, the flagship company of the Rs 30 billion Escorts group, and the US $ 2 billion First Pacific Company of Hong Kong, has awarded a contract worth US $ 100 million to Lucent Technologies, formerly the systems and technology business unit of AT&T.



Rajan Nanda of Escorts (left) and Bala T. Kuchinad of Lucent Technologies signing the contract.

The contract is for building and maintaining GSM cellular telephone networks in the three circles of Haryana, Uttar Pradesh (West), and Kerala, for which Escotel has been awarded licenses. Under the contract, Lucent Technologies will also install and maintain a backbone of microwave communications in the three circles.

Announcing the award of the contract, Rajan Nanda, chairman, Escotel Mobile Communications, says, "In Lucent Technologies, we have a dependable partner. Together, we will build quality GSM networks quickly. Building reliable and well-integrated networks is just the first step in Escotel's plan to provide quality cellular telephone services in the three circles which have a combined population of over 100 million. We chose Lucent as our main equipment vendor as it possesses a unique architectural solution for the Indian environment. Besides, Lucent is building a strong base in India which will provide a high level of support to the project."

"We are delighted with the opportunity to team with Escotel in building the infrastructure that will bring wireless services to consumers and businesses in India," says Lay Carter, president (network systems), Lucent Technologies Asia Pacific. "Lucent Technologies will be a total communications partner, bringing advanced technology, our global communications expertise, and experience in world-class wireless products to benefit Escotel and its customers."

Escotel's cellular phone services in the three circles of Haryana, Uttar Pradesh (West), and Kerala would be operational in six months. The company plans to cover 35 major towns and the interconnecting highways in the next three years, of which as many as 16 towns will be covered in the first year. These include the high growth cities of Meerut, Agra, Ambala, Panipat, Ernakulum, Trivandrum, and Calicut.

Escotel, which will have an initial equity of Rs 31 billion, plans to invest nearly Rs 180 billion in the first five years, and Rs 500 billion in 10 years.

First Pacific Company is a global corporation that operates in 40 countries. It has interests in telecommunications, banking, real estate, and marketing.

Lucent Technologies was formed as a result of AT&T's planned restructuring into three separate companies. Lucent Technologies designs, builds, and delivers a wide range of public and private networks, communications systems and software, consumer and business telephone systems, and microelectronics components. Bell Laboratories is the research and development engine for the company.

Vijaya Bank Goes On-Line

Bombay-based Vijaya Bank has become the first public sector bank to go on-line. Customers of six local branches of the bank can now access their accounts from any of the six locations.

This facility has been made possible through the use of Cisco routers. Vijaya Bank's wide area network (Wan), propped up by a backbone of Cisco routers, enables the bank to offer this reliable service. The bank intends to introduce additional services such as electronic fund transfer, electronic treasury terminal, and electronic cash management.

Says Anil Batra, country manager (India & SAARC region), Cisco Systems, "We are committed to providing high-tech solutions to leverage Indian banking into the global arena. Our solutions are equally useful for any service industry where customers increasingly demand the best, at all times. We are extremely happy to provide Vijaya Bank's customers with the most advanced technology available in the world today."

T.S. Raghavan, executive director, Vijaya Bank, adds, "We plan to extend this any-branch-banking-service to more branches in Mumbai, as well as to other major cities in the next phase. Vijaya Bank is proud to be the first nationalized bank with 835 branches across the country, to provide this state-of-the-art service, in line with innovative banking practices internationally."

With an annual turnover of US $ 2 billion, Cisco Systems is easily the world's largest internetworking company. It specializes in routers and switches, devices which allow a variety of different computer networks to be seamlessly linked together.

Cisco System's internetworking products and services are sold and supported in India by Wipro Infotech, Microland, UB Networks, Datacraft ICIM, Tata Unisys, and Apcom Computers.

Intel Launches 200 MHz Pentium Processor

Intel Corporation has introduced a 200 MHz Pentium processor that will power premium desktop systems in the second half of this year. The processor's introduction creates a trio of high-performance choices—200 MHz, 166 MHz and 150 MHz introduced in the first half of this year for high-end computers. The announcement also sets the stage for the 100 MHz to fill the entry level, and 120 MHz and 133 MHz Pentium processors to fill the mid-range of Intel's processor family in the second half of the year in India. The 200 MHz Pentium processor, built on Intel's advanced 0.35 micron processor technology, is in limited production today, and will ramp in volume over the next two quarters. The processor is housed in a new, more thermally efficient plastic pin grid array (PPGA) package. This, combined with the advanced process technology, enables the processor to reach its high clock rate.

Intel, the world's largest processor chip maker, is also a leading manufacturer of PCs, and networking and communications products.

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TIE-UPS

Polaroid Ties up with DCM Data Systems

Polaroid India has signed a memorandum of understanding (MOU) with Delhi-based DCM Data Systems to distribute its digital imaging products in India. "With DCM Data Systems as our partner for the distribution of digital imaging products, we will be in a better position to offer these products to the business and professional community," says Ricardo F. Maldonado, MD, Polaroid India. "Our distributors understand the need of the market and the special business applications that these powerful products enable, and would be in a position to offer the Indian users a fully configured solution," According to Veer Sagar, president and CEO, DCM Data Systems, "The shift towards total automation and multimedia in the Indian corporate sector, and the advent of competitiveness that has surfaced after the entry of multinational organizations, have created a substantial demand for imaging products that enable production of high-quality presentation under tight schedules. Business users are demanding powerful tools that allow a combination of flexibility. The Polaroid-DCM product, technology, and services combine will meet these requirements."



Ricardo F Maldonado announcing the tie-up with DCM Data Systems.

Polaroid is a leader in instant pictures based on silver halide technology. Its product range includes SprintScan 35, a high speed 35 mm digital film, negative or positive scanner that creates a brilliant digital image in under one minute, and PhotoPad, a digital photo scanner for home and office use.

ACI Infotech to Distribute Cyrix Processors

US-based Cyrix International, a company specializing in the design, manufacture, and marketing of processors for the PC industry, has appointed ACI Infotech as the distributor of its complete line of x86 processors for India and the Indian subcontinent. Cyrix recently introduced its 6x86 processor family with limited success.

Says Everett Rosch, VP, Cyrix Asia Pacific, "Cyrix is looking forward to a mutually beneficial relationship with the major OEM players in India. We are pleased to have ACI Infotech as a partner in the effort."

ACI Infotech is a major supplier of computer peripherals and has strategic tie-ups with leading brands like Seagate, Aztech, Sony, Teac, and Buslogic.

ComputerEyes Appointed TISL Business Partner

Bangalore-based Tata Information Systems (TISL), a joint venture between the Tatas and IBM Corporation of the US, has appointed New Delhi-based ComputerEyes, a company specializing in the development of GIS applications, as a business partner.

According to the agreement signed by the two companies, ComputerEyes will market and support IBM's range of PC products including notebooks, desktops, and servers including the RS/6000 family of servers and workstations.

Through the tie-up, TISL will gain easy access to the existing client-base of ComputerEyes. The latter will add value to IBM products by offering its GIS-based business solution Mappls, and provide turnkey solutions in vertical market segments including manufacture, distribution, and banking.

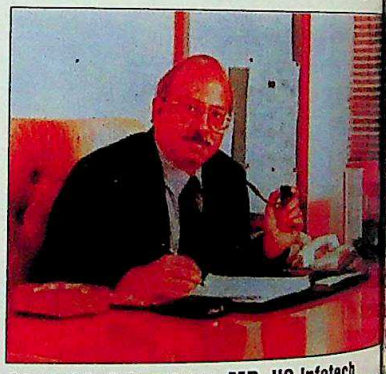
Says Paritosh Segal, country manager (channel management), TISL, " We are very positive about our relationship with ComputerEyes, and in addressing the business needs of our customers with best-of-breed hardware and software solutions. GIS-based business solutions have wide-ranging applications in marketing and logistics in a variety of industry segments."

Rakesh Verma, MD, ComputerEyes, adds, "There is a natural bond between IBM and us. ComputerEyes started with focus on software development and ... ing on IBM mainframes. With this ... ance, we are now in a position to offer ... IT solutions to not only our GIS cust... ers, but also to customers in other busin... application areas."

ComputerEyes specializes in deve... ing business solutions through the ... um of visual analysis of spatial and ... spatial databases. According to comp... officials, it has been maintaining a gro... rate of 100% since its inception in 19...

IIS Acquires Stake in Singapore Firm

IIS Infotech, a leading software de... opment organization of the cou... has acquired a 50% stake in EC... Information Technology (EIT) ... Singapore. EIT is a part of the EC... group, which has 11 member compa...



Saurabh Srivastava, MD, IIS Infotech.

IIS has the option of acquiring an ad... tional 10%, which will make it the m... ity shareholder. The management of ... company has already been transferred ... IIS Infotech.

Says Saurabh Srivastava, MD, ... "The joint venture is important to us ... cause the implications go far be... Singapore and extend to the entire A... Pacific region. Besides, the governm... of Singapore is an important and pow... partner, providing the perfect match ... blend."

IIS will provide access to the softw... products developed by ECICS, and ... introduce them in the Indian mark... well as in other parts of the world. EC... on its part, will introduce IIS projects ... vices and the IIS 2000 solution (that ... dresses the date change problem exp... at the turn of the century), to the A... Pacific market.

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Compaq, Seagate Join Hands

Seagate Enterprise Management Software—West (SEMS West), a wholly-owned subsidiary of Seagate Software, has signed an agreement with Compaq to enhance enterprise-wide management by developing Compaq-specific "behavior models" that run on the Seagate NerveCenter Pro event-correlation system.

The Seagate NerveCenter Pro behavior models will extend HP OpenView Network Node Manager to manage the behavior of Compaq servers, monitoring, correlating, and acting on events generated by Compaq insight management agents. This will enable a user at a centrally located Unix workstation to manage an enterprise network that includes Compaq systems. Agents from the Seagate LANAlert server-management system can run side-by-side with Compaq Insight management Agents, extending the monitoring range of both tools to include hundreds of additional operating system parameters in both Windows and NetWare environments.

Specifically, the behavior models will model Compaq Health MIB parameters and identify specific sub-system failures by selectively polling and correlating additional MIB values such as those associated with small computer system interface (SCSI) adapters, disk sub-systems, network adapters, and overall server environments. Through Seagate NerveCenter Pro's cross-object correlation capability, the models can detect complex failure dependencies (like the relationship of a temperature rise to the failure of a disk sub-system), and determine the probable cause. The behavior models are scheduled to hit the market in July 1996.

Gene Austin, VP (systems division), Compaq, says, "Production application environments once comprised only mainframe or Unix systems. Today, they incorporate large numbers of Compaq systems. As a result of the collaboration between Compaq and Seagate, a network manager will be able to see the Compaq management information consolidated within Seagate NerveCenter Pro, making it much easier to manage all levels of the enterprise infrastructure."

Roselie Buonauro, VP (marketing), SEMS West, adds, "Our partnership with Compaq is in line with Seagate's strategy of providing policy-based solutions that create out-of-the-box solutions for customers. The Compaq behavior models for Seagate NerveCenter Pro will mean network managers can avoid the complex task of developing their own software to ensure effective event correlation across the entire enterprise."

Seagate Technology is a data technology company that provides products for storing, managing, and accessing digital information on the world's computer and data communications systems. Seagate is the largest independent disk drive and related components company in the world.

Seagate Software develops tools and applications in the area of data management, including information management, network and systems management, and storage management.

Oracle WebServer Is Part of SCO Internet Family

US-based Santacruz Operations (SCO) has signed an agreement with Oracle Corporation for offering Oracle's WebServer 2.0 as part of SCOs Internet family. By combining the power and scalability of Oracle WebServer 2.0 with SCO OpenServer 5.0, the two companies have a scalable platform for building secure, dynamic web sites and applications for use over corporate intranets as well as the public Internet.

Says Richard French, VP (Intel Unix products division), Oracle Corporation, "With the availability of this integrated solution, Oracle has truly addressed the needs of the vast SCO installed base as well as new SCO customers by providing them with a sophisticated solution for information management on the Internet. As this new computing paradigm matures and makes demands on performance and scalability increase, Oracle WebServer, powered by the Oracle7 database, will provide a truly powerful and reliable WebServer platform."

Jeff Ait, VP (Internet), SCO adds, "We are very pleased to have the Oracle WebServer as part of the SCO Internet family. We will be able to provide a complete set of solutions and give customers the opportunity of integrating Internet into their business critical environments. Oracle and SCO have created a truly compelling offer for all our enterprise customers."

SCO is a leading supplier of Unix server operating systems, and a leading provider of client-integration software that integrates Windows PCs and other clients with Unix system servers from all major vendors. It operates in India through a Bangalore-based subsidiary.

VXL to Market EMC Storage Products

US-based EMC Corporation, a leading supplier of enterprise-wide intelligent information storage and retrieval systems, has appointed Bombay-based VXL Instruments as the distributor of its products and solutions in the country.

Says Richard Wojcik, GM (computer systems, Asia/Far East), EMC, "We feel that the robust growth of the market here, particularly those companies which require large data storage and retrieval, indicates a good sign for EMC to move in at this time."

J.R. Mundkur, marketing director, VXL, says, "VXL's strategic alliance with EMC Corporation adds storage solutions to its existing range of products. The rise of client/server computing, imaging, and internetworking technologies have created a new challenge—managing large data-related storage. EMC and VXL will address this challenge in the Indian market through easy access to EMC's intelligent storage solutions."

Internet Access Package

Rediffusion on the Net has announced the launch of a new package for the Internet, titled "Internet Complete". The package has been launched in strategic alliance with Microsoft India.

Priced at Rs 1,600, the package offers Indian subscribers a one-point solution to Internet connectivity. It includes a one-year subscription to the Rediff on the Net web site, the Microsoft Internet Explorer 2.0, a browser for surfing the Internet, a personal guide to the Internet, an application form required by VSNL to subscribe to the Internet, and technical support from VSNL authorised dealers.

Ajit Balakrishnan of Rediff on the Net says, "Internet Complete will accelerate the entry of the Internet into Indian corporations, offices, and homes."

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IN BRIEF

NIIT Launches Internet Courses

New Delhi-based NIIT, the leading IT services organization specializing in computer education and training, has introduced a series of comprehensive courses on the Internet.

Called InterNIIT, the courses provide simulated real-time surfing of the Internet.

The InterNIIT Contact programme is meant for beginners. It focuses on Internet applications, and imparts basic skills in accessing the Internet.

InterNIIT Connect teaches students to create a Web presence and acquire expertise on the Internet. The Connect programme includes modules on Hypertext Markup Language (HTML) programming, and Java, the interactive object-oriented programming environment for the Internet. It also covers Web server details and how HTML documents are transferred over the Internet.

NIIT's software development and instructional software groups have received ISO 9001 from BVQI, UK. NIIT's entire career education group has also received ISO 9001 certification from the same agency. In addition, the American Council on Education has established college credit recommendations for NIIT's career courses, enabling NIIT alumni to seek credit waivers in over 1,100 American colleges and universities, while applying for admission.

IJTC to Market World PC Expo In India

Delhi-based Indo Japan Trade Center (IJTC) has been appointed sole authorized representative by Nikkei Business Publication Asia, for World PC Expo.

According to the terms of the agreement signed by the two parties, IJTC will ensure suitable participation of the software and other market segments of the Indian computer industry in the various events, promotions, and exhibitions of the Nikkei group.

The forthcoming PC Expo '96, to held in Japan from September 4, is likely to witness the participation of the Indian software industry in full force with about 20 companies displaying their capabilities under the auspices of the Software Technology Park of the Department of Electronics, government of India.

Several independent participants from India like HCL and Mindware are expected to participate in this mega event which will attract over 200,000 participants from all over the world. Over 300 companies are expected to participate in the event. PC Expo '95 attracted 157,160 visitors from 189 IT companies.

Cals' Relief Does Well

The Relief range of network-ready workstations launched by New Delhi-based Cals has, according to company officials, received a favorable response in the market.

Relief is being distributed currently in the western, northern, and central regions of the country. The range has a Pentium-60 processor-based entry-level system at lower end and a Pentium 100 MHz processor-based system at the higher end. The models come pre-loaded with essential software so that they can function as Internet access workstations.

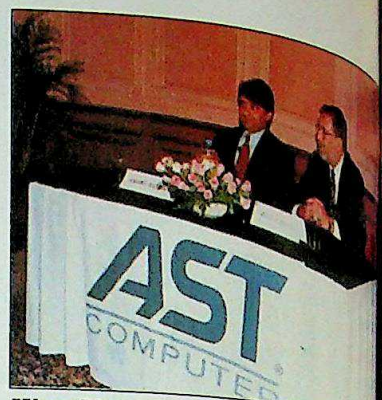
Cals clients include BHEL, ONGC, Birla Kent Taylor, NTPC, and the Indian Institutes of Technology.

AST Launches Commercial Desktops

US-based AST Computer, a leading PC manufacturer with an annual turnover of US $2.5 billion, has announced the launch of its new Bravo Spring Line of commercial desktops in India. The new family incorporates leading-edge technologies designed to enhance user productivity and efficiency.

The AST Bravo desktop family and minitowers boast three Pentium processors—100 MHz, 133 MHz, and 166 MHz—and three hard drives with configurations of 630MB, 1.2GB and 2.0GB. CPU subsystems come with 16MB of faster EDO RAM with parity capabilities and synchronous burst cache. Select models come standard with a 6 X CD ROM drive.

Says Ian Diery, president and CEO, AST Computer, "The new Bravo Line personifies AST's commitment to the latest technology at truly aggressive prices."



Mirza Bisravi (right) and Ashish Bambra[illegible] launch.

Adds Mirza Basravi, GM, AST M[illegible] dle East, "With highly optimized [illegible] systems and technologies, including [illegible] standard Extended Data Out (EDO) R[illegible] and pipeline burst cache, the latest Br[illegible] PC's offer enhanced power and per[illegible] mance to run sophisticated applicat[illegible] and are primed for tomorrow's 32-[illegible] environments. AST's Bravo PCs h[illegible] pushed the limits of PC performance [illegible] give customers superb performance [illegible] enhanced productivity."

Siemens Systems for Handicapped Children

Large recessed keys and a semi-circ[illegible] keyboard array are but two of the[illegible] special features of a training comp[illegible] specially designed for physically and m[illegible] tally handicapped children. The sy[illegible] has been designed and built by Siem[illegible] Nixdorf Germany.

Spastics and children with mental[illegible] orders can use it to learn or relearn wr[illegible] and arithmetic. As children undergo[illegible] training for special needs are often visu[illegible] ly impaired, exercises are shown in c[illegible] to make them easier to see on the scre[illegible]

The special keyboards are designe[illegible] prevent keys from being hit twice, or h[illegible] delayed reaction keys to prevent keystro[illegible] from being repeated unintentionally.

The system can be adapted to a w[illegible] range of disabilities, and is being mar[illegible] ed by the Siemens-Nixdorf "Comput[illegible] Help to Heal" project group in Bonn.

Siemens-Nixdorf also markets Sie[illegible] an advanced control system with w[illegible] seriously handicapped children can sw[illegible] lights off, turn the TV on, and operate[illegible] electric door-opener unaided. Comma[illegible] can be given in a variety of ways, inc[illegible] ing speech commands, or with the ho[illegible] a thin joystick which the patient op[illegible] with his leg or mouth.

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ovell Expands Course Range

ovell has expanded its programs for certified education of technical support professionals to include a new ies of courses and certifications fo- sed on the Internet and intranets. The ovell Internet Manager certification and sociated courses will train and certify dividuals in job skills needed to leverage full business opportunity of the Internet d intranets.

Novell's Internet Manager certifica- n program prepares those commonly erred to as "web masters" to manage overall technical project of running an ternet or intranet site.

Novell Internet Manager consists of courses and five examinations.

Novell also announced its plans to ork with Netscape Communication Cor- ration to develop Internet-based train- e modules.

umbai on the Internet

umbai-based Arya Computers and Collossus of Chicago have started a new web site on the Internet. Arya mputers officials claim that the site is dia's first exclusive city-based electron- magazine covering the city of Mumbai.

Called *Mumbai on the Net,* it serves as ne-stop information source on the city. e information provided ranges from story and government to shipping, eat- g out, tourism, emergency services and at have you! The site can be accessed e of cost. An interesting feature of the e is that even individuals can place their sonal home pages on the Internet at a minal cost of Rs 2,000 per annum. The e is sponsored by the Maharashtra Tour- n Development Corporation.

ndware Sets up oftware Lab

ndware, the software exports division of Pertech Computers, has set up a dedicated software development lab at ngalore for its partner Wilken of Ger- ny. The lab has been set up for a ation of two years, and is currently olved in application software develop- ent in the client/server environment.

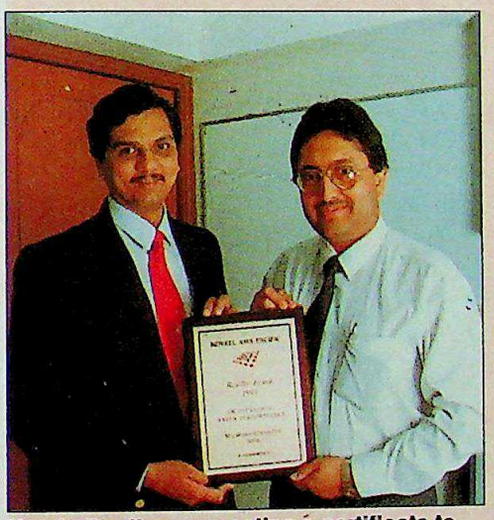
The cumulative effort required for various projects in this lab will be about 30 man-years.

Wilken, which is based in Ulm in Germany, is involved in software development and marketing. Its products are widely marketed in Germany, Austria, and Switzerland. Mindware's global operations in software development and consultancy provide state-of-the-art technology solutions. It has created specialized technology domains to provide focussed services to its clients. Mindware provides on-site, off-site, and off-shore services through dedicated software labs. Remote maintenance, product development, turnkey projects, and on-site consultancy are its main operational areas.

AWARDS/APPOINTMENTS

Wipro

The software products division of Bangalore-based Wipro Infotech has been awarded the Outstanding Novell Reseller award for the Asia-Pacific region. The award considers a number of qualitative and quantitative initiatives of the company towards promoting Novell products in the country.



Nandu Pradhan presenting a certificate to Sudeep Banerjee.

Says Sudeep Banerjee, VP (software products division), Wipro, "Networking is one of fastest growing segments, and we are glad to be recognized as a key player in the networking market by a world leader in networking."

Adds Nandu Pradhan, VP, Onward Novell Software India, "Wipro has been our reseller since our inception, and it is with the support from our partners like Wipro and others that we enjoy a marketshare of more than 90% in the Intel-based network operating systems. Wipro is the first Indian reseller to receive international recognition. We are working very closely with our authorized partners to maintain NetWare as the networking language of corporate India."

Rockwell Overseas Corporation

Jayant Chatterjee has been promoted to the post of VP and chief representative (India region) by Rockwell Overseas Corporation. He will be based at Rockwell's corporate office in New Delhi, and will represent the company in India and other South Asian countries. In his new position, Mr Chatterjee will report to William Fletcher, senior VP (international), Rockwell.

Mr Chatterjee has been with Rockwell since 1980. He was president of Rockwell subsidiary Allen Bradley India, before this promotion.

Mr Chatterjee appointment reaffirms Rockwell's commitment to building its business in India. "We have been doing business in India for decades, and now have a strong position in automotive component systems, industrial automation, avionics, and semiconductor systems," says Don H. Davis, president and CEO, Rockwell. Fletcher adds," Mr Chatterjee selection is a sign of our long-term commitment to the Indian market. We are very encouraged by India's growth, and believe that Rockwell's products and technology, teamed with the excellent resources available there, will foster further development of India's industrial economy." Jayant holds a Bachelor's degree in electrical engineering from Jadavpur University, and a Masters degree in management systems from the Indian Institute of Technology, New Delhi.

Akshay Software Technologies

C.V. Raju has been appointed GM (HRD and personnel) at Akshay Software Technologies. He will be overall incharge of the company's HRD department including appointments, employee training, and promotions. Prior to this appointment, Raju was GM (HRD/personnel) with the Chemox group.



C.V. Raju.

Akshay Software Technologies is a leading IT and management consultancy organization specializing in turnkey software engineering solutions involving client/server models and 4GL technology. It also distributes the Gupta product range in the country.

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IT SHOWS

Exhibition/Fair	Brief description	Date	Venue	Contact
BUSINESS TO BUSINESS '96	Show on office products and services, including computer hardware and software, and communications.	3-6 July '96 18-21 Dec. '96 21-24 Aug. '96 17-20 July '96	Bangalore Bombay Ahmedabad Hyderabad	The Assistant Manager—Coordination Conventions & Fair India 157 Princess Street Bombay 400 002 Tel: 2060808; Fax: 2080171
VLDB '96 (Very Large Database Conference)	An international conference on very large database management. Topics include database engineering, data warehousing, implementation techniques, distributed and client/server databases, hypermedia and object-oriented databases, and so on.	3-6 Sept. '96	Bombay	P. Sadanandan NCST, 6th Floor, Major Tower Visvesvaraya Centre Dr Ambedkar Road Bangalore 560 001 Tel: 91(80) 226 3100 Fax: 91(80) 226 1531
CSI '96	An IT show targeting computer users. IT manufacturers and service providers will display their wares. Business opportunities can be explored.	Oct. 30- 3 Nov. '96	Bangalore	M. Dayanand 401, 4th Floor, M.B.C. 134 Infantry Road Bangalore 560 001 Tel: 5511511; Fax: 5562971
COMDEX/FALL '96	A major platform for buyers, sellers, and decision-makers. On display will be the latest in products and services, including computer hardware and software, multimedia, networking solutions, communications, Internet, education and training programs, computer-telephony integration, mobile and wireless computing, and ISDN-related hardware and software.	18-22 Nov. '96	Las Vegas	Business India Exhibitions Wadia Building, 17/19 Dalal Street Bombay 400 001 Tel: 2663449/1425 Fax: 2664364/2041974
INFOCOM '96	An exhibition of computer, communication, networking, and telecom products and services for banking, business, and corporate sectors.	19-22 Nov. '96	World Trade Center Bombay	The Organiser Infocom '96 Exhibition 4A Naaz Building, Lamington Road Bombay 400 004 Tel: 3860436/3851781 Fax: 3874915/6260478
COMPONEX '96	A conference and exhibition of electronic components, materials, and production equipment.	25-28 Nov. '96	World Trade Center Bombay	Electronics Today A4 Naaz Building, Lamington Road Bombay 400 004 Tel: 3860436/3851781 Fax: 3874915
IT ASIA '96	The number one IT industry show of the country with active participation of IT delegations from the US, Europe, and South East Asia.	6-9 Dec. '96	Pragati Maidan New Delhi	MAIT, PHD House, 4th Floor Opp. Asian Village New Delhi 110 016 Tel: 6855487; Fax: 685 1321
COMMUNICATIONS '96	An IT exhibition on communications products and technologies. Good platform for forging commercial and business alliances.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647666 Fax: 4633506/4648692
BROADCAST CABLE & SATELLITE INDIA '96	A major international exhibition and conference on professional camera, lighting, sound, movie and video production, post-production products, radio and TV broadcasting, and cable and satellite systems.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647666 Fax: 4633506/4648692

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Optimizing Windows 95

Allen Wyatt & B.J. Sineath

Comdex Computer Publishing

Ansari Mahal, 10B Netaji Subhash Marg, Daryaganj

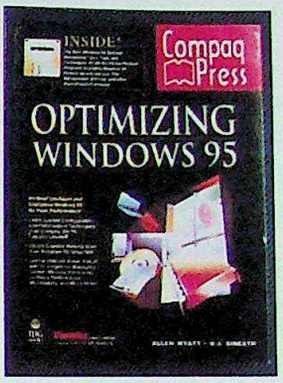
New Delhi 110002

Price: Rs 95; Pages 366

It is good that someone has taken the trouble to write a fairly comprehensive title on the practical aspects of making Windows 95 run smoothly, offering peak performance and speed.

Considering that the new operating system takes up as much as 40MB of disk space, almost twice as much as Windows 3.1, it is not possible to master every aspect of the software simply be experimenting with its features, or relying on electronic help. Books on Windows 95 abound, but most of them deal with features and options. *Optimizing Windows 95* is different in that the emphasis is on optimization. It focuses on tools, tips, techniques, and practical hints that go a long way in making the life of a Windows 95 user less miserable.

In the 16 chapters that the book has, the authors discuss crucial issues like ways and means of improving drive performance, increasing storage capacity, troubleshooting, memory optimization, and so on. There is a chapter on adding new hardware, and another on Microsoft Plus, the add-on that has created a lot of confusion. Though it is not an integral part of Windows 95, it supports a number of features associated with communications and compression. The situation is confounded by the fact that Microsoft Plus comes on a CD-ROM disk and not the usual floppies one is used to in the country. Then there are chapters on networking and mobile computing, two essential features of today's corporate computing. It is good that before getting involved in the networking-related features of Windows 95, the authors have discussed basic networking concepts like the Open Systems Interconnect (OSI) model. Unfortunately, although there is reference to a companion disk containing a collection of six shareware programs that are of particular relevance to Windows 95, the review copy did not have any. It is hoped that the book is being sold in the market along with the diskette, even if it pushes the cost factor up marginally. The quality of paper is only tolerable and printing quite below the mark. At places, headlines tend to merge in the background and are scarcely readable. A good title like *Optimizing Windows 95* deserved better treatment.



Programming in Microsoft Fortran 77

R.S. Salaria

BPB Publications, B14 Connaught Place, New Delhi 110001.

Price: Rs 90; Pages: 351

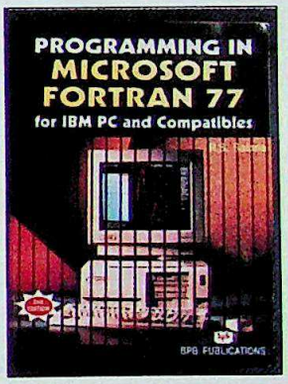
Programming in Microsoft Fortran 77, as the name suggests, is a specialized title. Don't be misled by the claim on the back cover that it is intended for the general reader with no prior knowledge of programming in Microsoft Fortran 77. It will not be of much use to general readers. On the other hand, if you have to sit for a written examination, the book may be used as a text book.

The author starts with an introduction to the world of computers, delves cursorily on the basic architecture of a microcomputer, and then moves on to software. This chapter, indeed, is for novices with little or no hands-on experience. The second chapter discusses basic programming tools like algorithms, flowcharts, decision tables, and structured programming. There are enough examples to see the reader through, however, the author takes recourse to definitions once too often. This cramps the overall style and may scare away a good section of readers, who would definitely prefer a more comprehensive treatment.

The introduction to Fortran comes much later, and it is a real disappointment. Fortran is dismissed routinely in less than half a page.

A redeeming feature of the book is the chapter on graphics programming in Microsoft Fortran 77, which is a subset of Fortran 77 meant for IBM PCs and compatibles. The treatment is slightly better, considering that the author has actually written entire paragraphs on the text mode, the graphics mode, and video adapters. The rest is scanty descriptions intended more for hurried reference than anything else.

Grammatical mistakes abound, and at places, unusual sentence structures have been used. Evidently, not much attention has been paid to editing.



Computers & Office Automation Industry

Business India Databases, Post Box No. 4921

Arjun Enclave, New Delhi 110029.

Price. Rs 500; Pages: 879

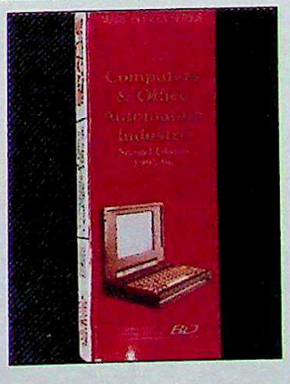
The task of compiling a comprehensive directory on the Indian IT industry is daunting indeed. All the more so, because organization has never been the strong point of Indian industry, and neither the computer segment, nor the office automation sector is an exception. Directories and databases abound, but very few of them are reliable. This directory or catalog, a publication in the Made In India Series of the Business India Group, is a massive compilation of information on the computer and office automation industry in the country.

The information is arranged in carefully selected sections including companies and professionals, products and services, and a more or less exhaustive exhibition calendar. In the companies and professionals section, the reader is treated to a listing of companies and individuals of the industry. In the products and services section, the listings are arranged productwise, and citywise. This section offers cross reference with the companies and individuals section, so that products and services can be linked to the companies that manufacture them.

An alphabetical list of products and services is provided separately, with cross reference to the products and services section.

For locating items in the directory, the publishers have provided an elaborate index. Products and services are arranged in the index under broad headings, and cross indexed to the products and services section for easy reference. The world exhibition calendar lists the major exhibitions scheduled to be held in calendar year 1996..

—Hirendra Chatterjee



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SEARCHING FOR A MIDDLE GROUND ON-LINE CENSORSHIP

Around the world, the Internet is inspiring many emotions—excitement, hope, and more than a little outrage.

Controversy is arising over the ease with which objectionable material can be accessed electronically. Stealing intellectual property is common.

Equally controversial are the steps some governments are taking to limit access to certain kinds of information on the Internet.

Objections may be loudest in the United States, where lately denizens of the Internet have grown accustomed to seeing blue ribbons adorning many web pages. These ribbons are a plea for the right to free speech in cyberspace.

It's a right the U.S. Congress abridged to an unfortunate extent when it recently passed the sweeping Telecommunications Reform Act. This legislation took many positive steps, such as opening the industry to broad competition and encouraging investment in modern network manufacture.

But the most striking evidence that Congress went overboard was language in a part of the new law called the Communications Decency Act which could make it a felony—punishable by five years in prison and a $250,000 fine to discuss topics such as detailed information about birth control, AIDS prevention, and how to get a legal abortion.

The Clinton administration has vowed not to enforce this provision, which is being contested now in federal court in Philadelphia.

Some people think the Internet should be wide open. They believe interactive networks are a world apart in which copyright, libel, pornography, and confidentiality laws do not apply. This is a native dream which fails to recognize that the Internet is going to be a vital part of mainstream life, and not a lawless backwater.

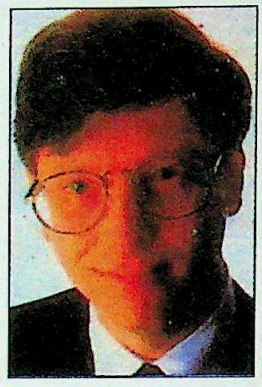
At the other extreme, some people think the Internet should be tightly controlled. They would ruin the Internet in the name of reining it in.

We must find a balance that lets the Internet be both open and sheltered from abuse.

A web page devoted to the blue-ribbon campaign got it right: "The voice of reason knows that free speech doesn't equate to sexual harassment, abuse of children or the breeding of hatred or intolerance. We insist that any material that's legal in bookstores, newspapers, or public libraries must be legal online."

The United States isn't the only place clamping down. In every country you'll find sensitivity to some type of material.

China is attempting to restrict political expression broadly, in the name of security and social stability. It requires users of the Internet and electronic mail to register.



"We should resist measures that go too far. If authorities aren't careful, they'll eliminate much that's good about the interactive medium while trying to root out "bad" content."

In the United Kingdom, state secrets and personal attacks are off limits.

In France, which has a proud heritage of press freedom, the Internet attracted recent attention when a banned book on former French president Francois Mitterand's health history was republished electronically on the World Wide Web.

As it happens, the electronic republication of "Le Grand Secret" by a third party wasn't banned by a court which nonetheless did rule that the printed version of the book unlawfully violated Mitterand's privacy. But if the content had been banned, it easily could have been placed on a web server outside France and beyond the jurisdiction of French law.

This is a real problem for governments. Germany, for example, wants to keep neo-Nazi propaganda from its citizens even though the information is posted on a server in Canada—where it is perfectly legal.

Governments have long tried to keep unwanted information outside of national borders.

Until very recently, Japan considered almost any picture or video that displayed full frontal nudity to be taboo. Dozens of housewives equipped with sandpaper were employed to scratch objectionable material from pictures in imported magazines such as *Play Boy*.

But attitudes have changed so dramatically that many popular Japanese weekly magazines now include photographs of nude females. Presumably the sandpaper trade is a dying profession.

In the emerging world of interactive works, companies that distribute packaged electronic information cannot be asked to filter the consumer of what they carry any more than a telephone company can be asked to take responsibility for everything that is spoken on a telephone system.

So how can authorities, including governments in any country, effectively filter access to information on the Internet?

The best solution I know of is for authorized organizations to review, categorize and rate the content of web pages so that software can filter out that which is deemed inappropriate.

Ratings are not a new idea. Movies are already rated in many countries, although with varying standards. Canada alone has seven standards systems, with most provinces having their own.

In the United States, where Congress has mandated that new televisions soon be equipped with a "V-chip" to allow parents to block unsuitable shows, the commercial networks are moving toward a rating system.

Ratings are rapidly coming to the Internet. CompuServe's new WOW service which allows parents to limit their children to approved Internet sites, and Microsoft is among companies building support for ratings in forthcoming web-browsing software.

Parents will be able to configure the software to display information only from sites that have acceptable ratings.

Different rating systems are likely to answer key questions differently, giving parents—and governments—a choice of approaches.

For example, one question is whether advertisements should be rated so they can be blocked. Televised baseball is suitable for small children, but the accompanying commercials for violent movies may not be. Similarly, the editorial content of an Internet site may be kid-friendly even though the advertising it displays isn't.

No rating scheme is perfect. Some objectionable material will get through. But a rating system will work most of the time. It is the best approach I can imagine that doesn't unduly interfere with the great benefits of the Internet.

We should resist measures that go too far. If authorities aren't careful, they'll eliminate much that's good about the interactive medium while trying to root out "bad" content.

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Questions may be sent to Bill Gates at the address is askbill (AT) microsoft

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Bill Gates' Tips for Top Managers:

DON'T PAY TOO MUCH ATTENTION TO REVENUE PER EMPLOYEE

In India, revenue per employee has been considered a good index for measuring the productivity of a company. This practice is not good, and with outsourcing becoming the order of the day, revenue per employee becomes a meaning less, if not faulty, index of measurement.

What kinds of human resources policies and strategies do you use to ensure that your revenue per employee is at an optimum level?

Revenue per employee is a simple calculation to make but it's not a good measure of efficiency.

To calculate a company's revenue per employee, you merely divide its number of employees into the amount of its annual revenue. A 100-employee corporation that takes in $20 million a year has revenue-per-employee of $200,000.

All things being equal, achieving $200,000 per year in revenue per employee is better than achieving only $150,000. But it's rare that all things are equal.

An organization that needs relatively few employees, perhaps because it outsources some work may have high revenue-per-employee. But it may not be as efficient as another company that has somewhat lower revenue-per-employee because it employs more people and does everything internally.

I'm not suggesting that it's bad to outsource. On the contrary. Microsoft outsources all the time—for functions from landscaping to CD-ROM manufacturing. We focus our internal workforce on those areas where we have greatest competence, such as writing software and managing big projects.

Outsourcing will get more common as communications system such as the Internet make it easier for companies to work with outside suppliers as readily as they work with in-house departments. As this trend accelerates, revenue per employee will become ever less meaningful as a measure of efficiency.

Companies that are managed with the goal of achieving a certain amount of revenue per employee run the risk of encouraging outsourcing in situations in which it may not make sense. Managers tend to come up with creative ways to move tasks outside a company to protect an internal budget—even when it isn't in the broader interests of the company. The reverse can happen, too.

A manager with an insufficient outsourcing budget may hire employees to perform a task that would be better performed by outside contractors. Many companies control their payroll very well but fail to discipline the outsourcing budget. This can lead them to not really see where costs are rising.

> ***Outsourcing will get more common as communications system such as the Internet make it easier for companies to work with outside suppliers as readily as they work with in-house departments.***

Microsoft's human resources strategies focus on attracting good employee and keeping them happy and productive. We don't consciously strive for a particular average revenue level per employee.

Instead, we focus on what percentage of the revenue pool is devoted to broad categories of expenditure, such as research-and-development, the cost of goods, personnel, and marketing.

Any company, even a small one, can take the same approach. I tell entrepreneurs to find a role-model corporation in their industry and study its profit-and-loss statement. Get to know, off the top of your head, what percentage of revenue goes into various cost pools. Then ask yourself. Can you achieve that? It's a much better approach than paying too much attention to revenue per employee.

Do you think the fax machine represents an interim technology like the typewriter, ultimately to be squeezed out by e-mail?

It won't happen overnight, but it's very likely that the fax machine will fade in popularity. Electronic mail is faster and more flexible. It also works for documents that aren't—or can't be—printed on paper. PCs are often used to send and receive faxes, eliminating paper at one or both ends of the transmission.

This is quite different from E-mailing a document, though. A facsimile is just the image of printed pages. In contrast, an electronically transmitted document gives the recipient the ability to search, edit, or manipulate its content.

Still, using a PC to send a fax will make a lot of sense until E-mail addresses are as common—and as commonly known-as fax numbers are today.

I graduated from high school and now own a small software company that I run from my house. My goal is to make a fortune. Since you never actually graduated from Harvard, it made me realize even more that college is a waste of time. Ignoring all the media hype and sales pitches, what are your thoughts about what I am doing?

You're almost certainly making a mistake, unless you're faced with a far better opportunity today than you think you'll ever face again.

It concerns me to hear young people say that they don't want to go to college because I didn't graduate.

For one thing. I got a pretty good education even though I didn't say long enough to get my degree. For another, the world is getting more competitive, specialized, and complex each year, making a college education as critical today as a high school education was at one time.

College is a great time to learn about the world and spend lots of time with people of your age. It's not smart to get locked into a particular career track until you see more of the choices.

College can be a fun time, too. There's no real reason to be in a rush. You're going to be working a lot of years. What's the hurry?

I loved my years in college and, in many respects, I regretted leaving. I did it only because I had an idea—founding the first microcomputer software company—that couldn't wait.

It may seem ironic, considering that I didn't get my degree but Microsoft focuses its hiring for most positions on college graduates. We believe that the maturity and learning that a college education offer are invaluable, and we've seen that people with liberal arts education bring wider knowledge of the world to bear on their jobs.

I've said it before, and I'll say it again. Go to college.

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EVERYBODY'S TALKING

DEBATE ON NETWORK COMPUTERS

By Dewang Mehta

The era of the personal computer "is almost over and the era of the network computer is abodut to begin," says Larry Ellison, chairman and chief executive of Oracle and the chief promoter of the network computer (NC), as he calls it.

Predicting the advent of a new information technology "megatrend", Mr Ellison has caputured the attention of the computer and software industries as well as millions of computer users worldwide with his promise of Rs 18,000 price for a computer.

When Mr Ellison began his NC campaign last year, prominent leaders of the PC industry scoffed. Michael Dell, Dell Computer chief executive, referred to it as a "back to the future" concept, implying that it turned back the clock to the days of centralized mainframe computer systems.

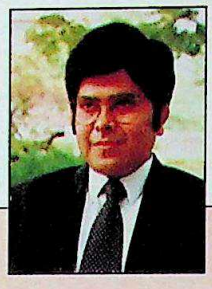
Over the past six months, however, Mr Ellison has wooed NC supporters from the software, consumer electronics, and computer industries. Last month at an NC rally in San Francisco, more than 50 companies including Apple Computer, IBM, Netscape Communications and Sun Microsystems endorsed NC standards.

At the heart of the debate over NCs—also known as network appliances, thin clients or network terminals—are contrasting views of the future role of the Internet and private corporate intranets.

Fueling the debate are the competitive interests of some of the world's largest software and computer companies. There is nothing that Mr Ellison would like to see more than to have arch-rival loose its grip on the personal computing software market.

Similarly, it is to the benefit of companies such as Netscape and Sun Microsystems—the largest providers of Internet software and server—to promote the use of the Internet. In contrast, Microsoft and companies such as Compaq computer that have flourished in the PC market clearly have a vested interest in preserving the status quo.

Mr Ellison maintains that the Internet and intranets are about to spawn a radical change that turns the concept of a PC on its head. Instead of putting computer power and numerous application programs on every desk, the NC minimizes the desktop unit and relies heavily upon the power of network "server"—larger computers that store data and software and service the needs of all users linked to a network.



> ***Mr Ellison has touched a raw nerve in the PC industry with his charges that the ubiquitous desktop computers are too expensive and too complex to use.***

In the corporate setting, the NC could be linked to an office local area network. For the computer at home, the NC would be hooked up to the Internet.

PCs are too expensive and complex, Mr Ellison maintains. With the NC, he says, "the complexity is moved out of the appliance and back in to the networks." He draws an analogy with television cable networks and telephone networks which are "enormously complex, but the devices that bring these services to individuals are inexpensive and easy to use."

He has demonstrated prototype NCs built for less than Rs 12,000 and he promises that NCs selling for only about Rs 18,000 will be available before the end of this year. While he does not see NCs replacing PCs, he predicts that NC sales will outstrip those of the PCs by the end of the decade.

From Mr Gates perspective, however, the Internet and corporate networks are facilities that extend the capabilities of PCs, rather than displace them.

"Microsoft will embrace and extend standards and technologies coming out of the Internet and provide great implementations for the PC and (Apple) Macintosh," he

Mr Gates argues, moreover, that
have two significant drawbacks. Firs
points out, NCs will not run the pleth
PC software that is in use today. "The
has more than 150 million users of Win
and 5 million people are developing
dows software.... Microsoft's strate
wards, rather than discards, the invest
these people and companies have ma

Secondly, he argues that NCs
quire broadband networks in order to
programs and data stored on remote se
at an acceptable speed. "The machine
find a place in the corporate market
where intranets are becoming vital and
band networks are fairly common," he
cedes.

However, network terminals "wil
less acceptance in homes, where narrow
and midband connections (such as
and cables modems) to the Internet
the rule for several years," Mr Gates s

Even some of the avowed suppor
the NC agree in part with Mr Gates' a
ment. IBM, for example, is focusing
tial NC efforts at the business marke
rather than consumers.

No doubt, in the corporate arena,
the main attentions of the NC will be
sharply reduces the "cost of ownersh
the desktop computer.

Most NCs, however, are expected
applications written in Sun Microsys
Java programming language and stor
the network servers. A significant chal
for NC manufacturers, therefore, will
encourage the development of Java ap
tion programs that mimic the function
appearance of popular PC programs.
the recent introduction of 'Active X ob
by Microsoft, even the domain of Jav
be threatened.

Supporters of the NC may be pro
too much, too soon, industry analysts
It will take time for NC software
developed for the business market, a
longer for high-bandwidth networks to
consumers homes in most parts of the
Nonetheless, Mr Ellison has touched
nerve in the PC industry with his charg
the ubiquitous desktop computers
expensive and too complex to use. A
the threat of competition from NCs is
ring efforts to develop lower-cost and
to-use PCs.□

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Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

Crassified Intellitrance

"486 Packer Barrel computer with monitor, CD-ROM, dual HD, $650."—*THE CHICAGO TRIBUNE*

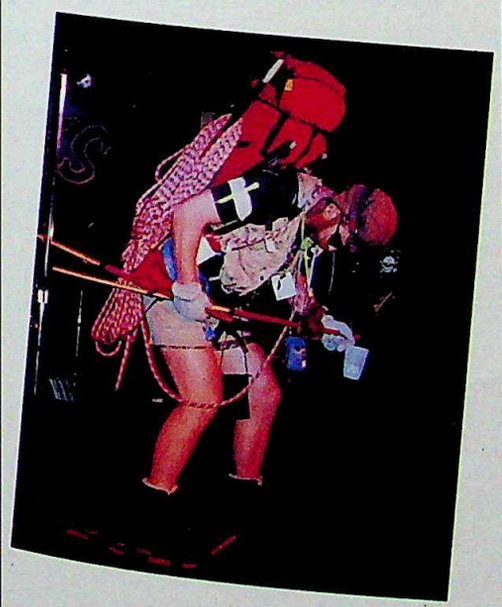
Why We Really Miss ABBA

Swedish supergroup Ace of Base has a song on its latest album called "Strange Ways." Among the lyrics is this excruciating stanza: "God bless you for being / by my side when I fell through / You could hear me you've got / Internet gateways through my world."

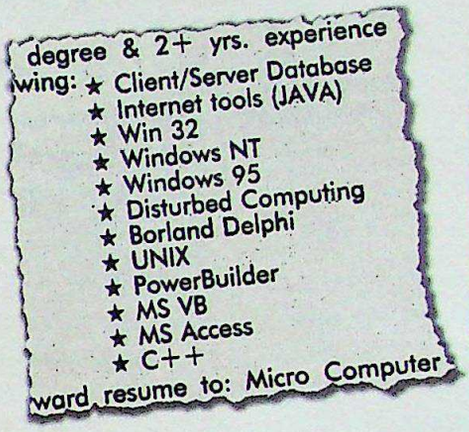


This Squelling Checker Really Squinks

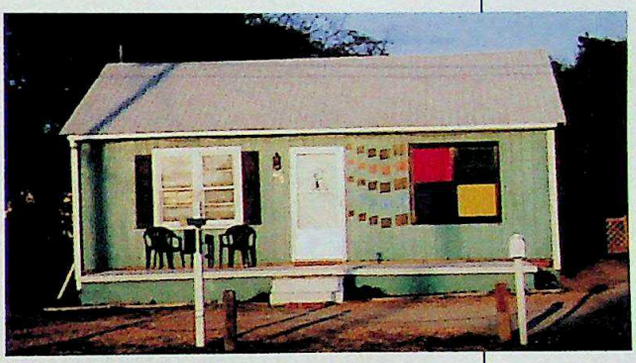
Faithful reader Glenn Gruner reports this spell-checker fiasco. Before: "Ford is changing their quality support functions from SQIs and SQAs to SQEs." After: "Ford is changing their quality support functions from Squish and Squash to Squeal."



Traveling Software CEO Mark Eppley, the man who brought you LapLink, promotes the new Windows 95 version by dressing up like a mountaineer and playing an impromptu "air ski pole" concert. Whatever works, Mark.



Do you have the right stuff for this job? (*The Louisville Courier-Journal.*)



ARF on the Road: Myrtle Beach, South Carolina. Must be Bill Gates's new vacation bungalow.



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EDITORIAL

By Kirtimaya Varma

If Telecom Is Infrastructure, Why Not Computers?

With the first budget of the new government round the corner, it's time to look forward to see what needs to be done to enable the PC industry come into its own. For one thing, we have now a government whose commitment to computerization is not as well known as with past governments since December 1984, when the computer policy was enunciated. The present government leans precariously on the left crutch, and the leftists have always been at loggerheads with computerization. True, times have changed and even leftists seem to be grudgingly veering round the view that the process of computerization is irreversible. This change is best exemplified by the fact that the most eminent Indian communist leader, Jyoti Basu, chief minister of West Bengal, who had in the 1980s refused to inaugurate a CSI show on the ground that computerization was anti-labor, had no qualms in inaugurating the 1990 CSI show in Calcutta. Nevertheless, left is left, and its relationship with computerization is at best a marriage of convenience, and at worst a marriage of inconvenience. A government with the left support is unlikely to have computerization on the right side of its priorities.



There is one more reason that the new government may be less enthusiastic about computerization. Prime minister Deve Gowda is not known to be a computer buff, unlike Mr Narsimha Rao or the late Rajiv Gandhi. How far this factor will play a role in his IT policies is yet to be seen. Ever since he formed the government on June 1 last, he has not made any pronunciations that reveal his thinking on IT.

Before we go into what needs to be done, let us look at the Indian PC scenario briefly. The PC industry has been growing at a rate 5-10% higher than the CAGR of the IT industry at 40%. The Indian PC market is one of the fastest growing markets in the world, and has been projected to grow at 49% till the next financial year 1997-98. In 1995 total PC shipment was 373,969 units, valued at $803 million. While the PC industry in India is showing signs of a boom, we are yet no where near global standards. The PC penetration in India is hardly 1 per 1,000 persons, way behind the world average of 25, and the US average of 256. And with Indian IT constituting merely 0.7% of the GDP, as against the world average of 3%, no effort should be spared to bring the figures to a more respectable value, if India is to emerge as a computer-conscious nation.

Now seems to be the best time for ushering in the change. While 1995 saw the signs of a PC boom, we are on the threshhold of an avalanche of PC boom. The factor triggering this avalanche is obviously the Internet. The growth in Internet connections has hitherto not been fast presumably because the general category of public has no option but to seek Internet connection from VSNL, an organization traditionally associated with monopolistic feudalism, customer harassment, and poor services. How feudal is the mental make-up of this organization can well be seen from the fact that its CMD B.K. Syngal is a strong advocate of international telecom monopoly, while the world over such monopoly is being studiously ended. Notwithstanding Mr Syngal's advocacy, the government has fortunately decided in principle to end VSNL's monopoly in providing Internet connections to the public, and allow the private sector to compete with VSNL. When this comes about, and Internet services are made available through customer-friendly companies, the incubus to the growth of Internet connections in the country will be removed, and there will be an explosion of PC usage.

The coming budget is crucially placed to act as a catalyst to fuel this explosion. People must be able to buy a PC and associated softwares when they want them the most, or else they may lose interest. For one thing, inspite of a seemingly good PC growth rate, India is way behind the world not only in terms of PCs per 1,000, but also in terms of PC technology used. Till as recently as 1994-95, when 386 was dying out all over the world, in India it was the mainstay of the market, with 386 sales constituting almost 49% of the PC sales. In 1996-97, when 486 is on its way out in major IT countries, in India it will continue to form a significant chunk of the PC market, if not the mainstay. Such technology backwardness may cost India dear. In the present age of the global market, IT provides the competitive edge to be in the mainstream of global business. The PC age in ambitious India is rather primitive to face the challenges of a cut-throat and competitive market.

Just as telecom was brought into the infrastructural sector about a decade ago, after being considered elitist ever since the first budget of independent India, computers too should be considered an infrastructural requirement, so that budgets can make good allocation on their growth and development. India accepted telecom in the infrastructural sector after successive studies, including those conducted by UNO, revealed that GNP grew in proportion to telecom facilities. Studies are pouring in showing the direct link between global competitiveness of a nation and expenditure on computers. Five decades ago the quantity of steel produced in a nation was considered an index of its progress. Today computers and telecommunications seem to be the index. With the convergence of telecom and computers, the two have become different sides of the same coin. It doesn't appeal to reason that while telecom is in the infrastructural sector, computers should still be elitist.

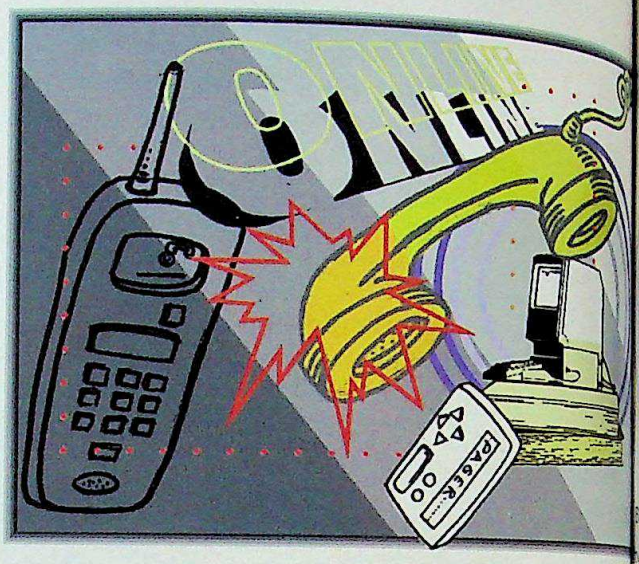
If Mr Deve Gowda's government goes against its grain to declare computers in the infrastructural sector, and gives them the kind of budgetary privileges enjoyed by other infrastructural sectors like power, telecom, water, transport, and also adopts measures to boost the industry like lowering duty rates on finished products, removing import duty on software, and so on, Mr Deve Gowda would emerge as the hero who struck the IT iron when it was hot. □

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The New PDA

Hand-held devices head online.



PDA manufacturers are rapidly repositioning their machines as appliances for the online era. Hand-helds, which have been gaining telecommunications capabilities for several years, are now starting to evolve into true creatures of the Net.

Mainstream PDAs now offer graphical Web browsing, Internet mail, and access to online services. And at least two manufacturers stand ready with products for forthcoming digital cellular networks.

The most striking recent event was General Magic's debut of software that equips MagicCap communicators with Web access and Internet mail via standard connections to any Internet service provider. The Web browser supports HTML 2.0 graphics, tables, and forms.

General Magic positions its communicator as a lower-cost notebook replacement for mobile professionals who don't need a full-fledged PC on the road. The company sees a significant role for the communicators on intranets, as well as the greater Internet. Prior to the announcement, MagicCap communicators—manufactured by Motorola and Sony—already supported a variety of land-line and wireless mail and paging capabilities.

Motorola has just introduced Mail on the Run for the Envoy, its MagicCap communicator. The software provides cc:Mail and Microsoft Mail connectivity via wire-line or via the unit's built-in wireless radio modem.

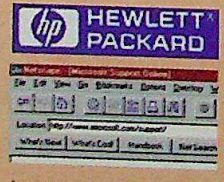
Apple's Newton has offered a wide range of connectivity options, many from third-party developers. Apple is releasing of a set of four software libraries or "enablers" to foster development of new solutions. The Newton Internet enabler combines a dialer, a TCP/IP stack, a PPP/SLIP component, and a domain-name resolver. This is the basis for Newton's support of a variety of potential Internet apps, including Web browsers, newsreaders, mail, and Telnet.

Sharp's Zaurus 5800 offers developers a mail API for creation of software for third-party mail systems. Sharp already supports Microsoft Mail and will support cc:Mail shortly. An Internet mail client is a future possibility. The 5800 comes with a client for AT&T mail that supports attachments. Mail is also available for the Zaurus's built-in CompuServe client, which supports attachments and Internet mail. The Zaurus also supports two-way paging with optional hardware. But access to the Web is limited to Unix sessions via the terminal screen.

Meanwhile, Hewlett-Packard's venerable HP 200LX palmtop supports a wide range of third-party solutions for Internet access, mail, and wireless communication. And HP is committed to developing an Internet mail package. The company recently introduced PsiMail, which gives Psion Series 3a users access to Microsoft Mail and cc:Mail systems with other mail-system support to follow.—*Jonathan Matzkin*

Waiting for Digital Cellular

In late February, Hewlett-Packard introduced one of the coolest hand-helds ever. The OmniGo 700 couples a version of the popular HP 200LX palmtop with a tiny, detachable Nokia cellular phone. The two components communicate with one another via a data interface, making the OmniGo 700 a self-contained wireless voice and data communicator. There's only one catch: You can't use it in the U.S., because the Nokia phone operates on the global system for mobile communications (GSM) standard, the digital cellular standard currently popular in Europe.



You can't use one of Psion's newest innovations, either. The company recently introduced a two-way messaging device that connects its Series 3a palmtop to a Nokia GSM cellular phone. Psion's Telenot link works under the SMS short message standard, which is a subset of the GSM standard.

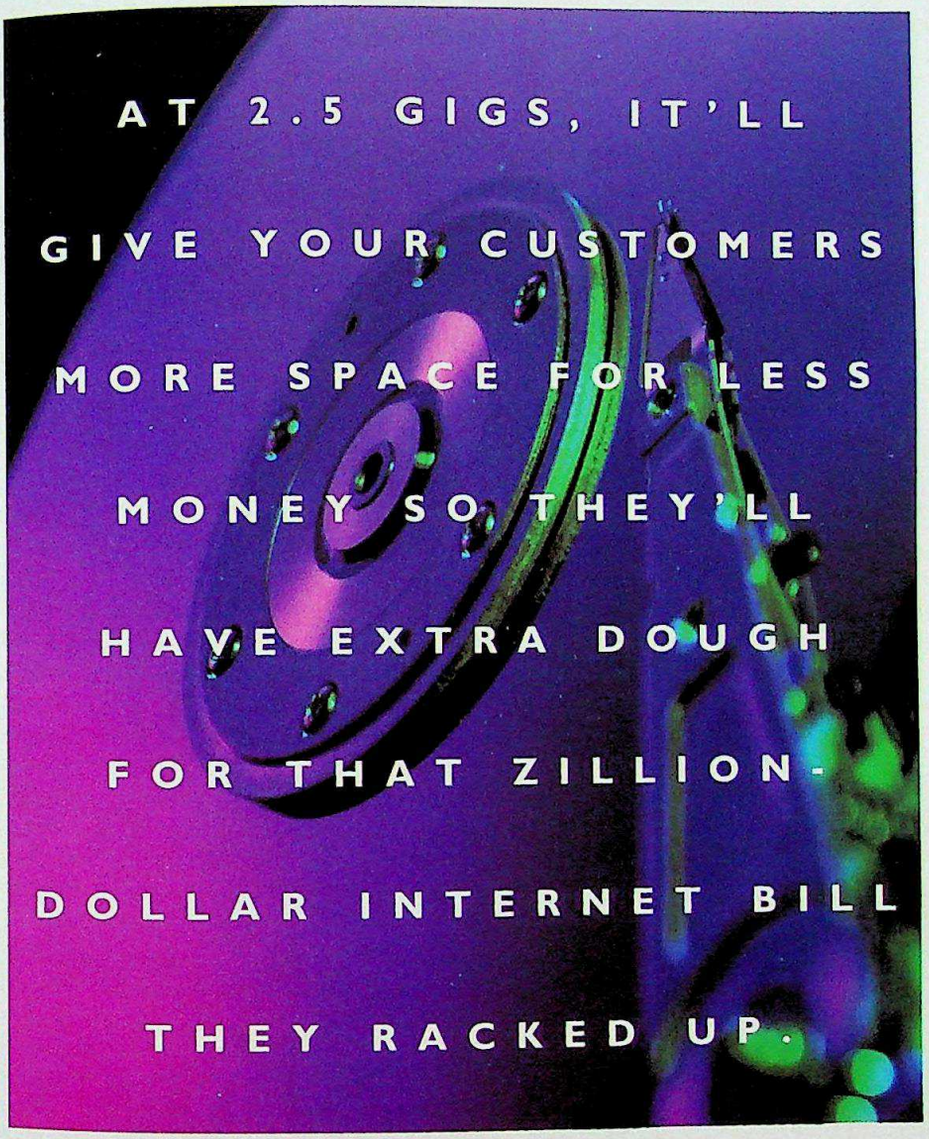
So when will GSM fully arrive in North America? It's available now in Washington, D.C., and parts of Canada and, according to Psion, is "gaining momentum" in the U.S. Hewlett-Packard says U.S. availability of the OmniGo 700 depends on the future introduction and stabilization of GSM services. The device will be introduced regionally as services become available. Hewlett-Packard says the OmniGo 700 will provide fax, short messaging, and wireless data communications in areas with full GSM service.—*JM*

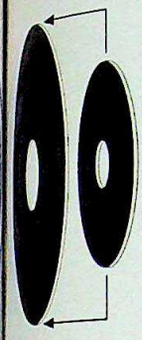
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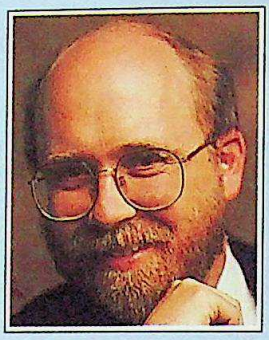
PIPELINE

By Jake Kirchner

Buying a New PC: Decisions, Decisions

With my luck, this was bound to happen. Now that I'm once again in the market for a new home PC—my fourth in a little more than a dozen years—I find I'm confronted with far more difficult choices than I would have faced just a few months ago. Even though this means my decisions will be harder, it's obviously more of a kid-in-the-candy-store situation than a dilemma, and it's a welcome change from the business-as-usual environment we've been in lately.

It's not that the PC industry has been boring the last couple of years; rather, it's just been pretty straightforward. If you wanted a home PC, you knew you would be getting a multimedia PC. The leading home PC vendors were offering roughly the same packages at roughly the same prices. Your budget would dictate what processor the machine would have, and you only had to figure out if you could afford a slightly bigger hard disk, a larger monitor, or better speakers.



This fall, I'll be joining you as I start the great buying cycle again.

Today, the PC industry is taking yet another giant evolutionary step. We're on the threshold of some of the most technologically exciting—and confusing—times in the history of the PC, as we greet the near-simultaneous arrivals of new processors, peripherals, and communications options.

Intel is cutting Pentium prices repeatedly as it seeks to outdistance AMD and Cyrix at the low end and to hasten the move to the full 32-bit era, which it hopes to rule with its Pentium Pro line. By the end of the year, the company will have added multimedia extensions (MMX) to the Pentium line to enhance the home computing experience greatly, with machines costing less than $2,500. Intel will also have driven Pentium Pro prices low enough to make power machines available that cost less than $3,000.

In the peripherals arena, a new generation of storage devices are remaking the market. Zip, Jaz, CD-R drives, Digital Versatile Disk (DVD), and other drive options are making obsolete the "old" hard disk/floppy/CD combination with which we've grown so comfortable. And don't forget scanners, which will come integrated in a number of new machines this fall. Lastly, what about really big monitors? Not just 17- and 21-inch jobs, but the 35-inch TV monitors that are already showing up connected to PCs. Which of these new devices to choose?

Outside the box, the soon-to-arrive Universal Serial Bus (USB) and the "Firewire" (IEEE 1394) standard bus will not only make it easier to connect keyboards, trackballs, and other input devices to your PC, they'll also greatly enhance your ability to add game controllers, video cameras, and stereo systems. Is this the year you move your PC into the family room?

As for communications, although PC modems have pretty much topped off at 33.6 Kbps, PC vendors are starting to incorporate voice/data modems for videoconferencing capabilities—at least as options—and you may be considering ISDN service and dreaming of cable modems and ADSL. You have to think long and hard about what communications paces you'll put your new PC through in the coming three or four years.

I don't want you to think this is a bad time to buy a PC; in fact, never have you been able to get so much for so little money. Just make sure you do your homework. By this fall, I'll be joining you—notepad in hand and back issues of *PC Magazine* in lap—as I start the great buying cycle again.

Internet Mail That's Made For Mobility

Sun and Netscape ready smarter e-mail software.

Although e-mail is inarguably the most popular use of the Internet, the underlying technology that delivers electronic messages is far from reliable. SMTP (Simple Mail Transport Protocol) is not the most robust or feature-oriented protocol; nor does it compare in features or security to proprietary mail systems like Lotus cc:Mail. Sun Microsystems, Netscape Communications, and other developers say they have a next-generation Internet e-mail standard called IMAP4 (Internet Message Access Protocol, Version 4.0) that could be the successor to SMTP.

Existing Internet e-mail programs, which run SMTP and POP3 (Post Office Protocol receives messages from the server), store the mailbox—known as the message store—on the client. But if that mailbox is somehow lost, so are all the messages. IMAP4 solves this problem by letting you make multiple copies of the mailbox, while the central mailbox remains on the server.

Since IMAP4, like Lotus Notes, lets you log on from multiple computers at different locations and synchronize your local mailbox with the mailbox on the server, it works well for mobile users who are disconnected from the server. Not only can mobile users work off-line and synchronize changes later, they can also choose to download certain messages only or to download text but not attachments. On the server end, administrators can back up and manage the mail system centrally.

Sun Microsystems, Netscape communications, and other developers say they have a next-generation Internet e-mail standard called IMAP4 that could be the successor to SMTP.

IMAP4 also has a sophisticated folder scheme that supports shared folders, plus filtering operations that drop incoming messages directly into folders.

If software developers follow IMAP4's rules, it should be possible to mix and match IMAP clients and servers on the same mail network. IMAP4 may also be a good way for developers of intranet software to distinguish their products.

Both a preliminary version of Sun's Solstice Internet Mail Server, and IMAP4 client "reference" software are available for download. A prerelease version of Netscape's IMAP4-based mail server is also available and will be integrated

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

NOTEBOOKS

Tecra 720CDT Sacrifices Size and Weight for Groundbreaking Video

By Jan Ozer and Brian Nadel

Depending on how you look at it, the $6,299 Toshiba Tecra 720CDT is a 10-pound, cutting-edge graphics workstation or one of the world's most advanced notebook PCs. The difference is a matter of semantics, because the Tecra 720CDT bristles with advanced technology that narrows the gap between notebook and desktop PCs. On the other hand, the Tecra 720CDT goes against the trend toward smaller, thinner, and lighter notebooks.

At 11.8 by 9.1 by 2.3 inches, the Tecra 720CDT harks back to an era of briefcase-bursting systems. Its system weight of 7 pounds 9 ounces is about 4 ounces heavier than that of the ThinkPad 760CD, the Tecra 720CDT's closest competitor. With CD-ROM, floppy disk drive, and power adapter, the Tecra 720CDT's travel weight swells to an armstretching 10 pounds 6 ounces.

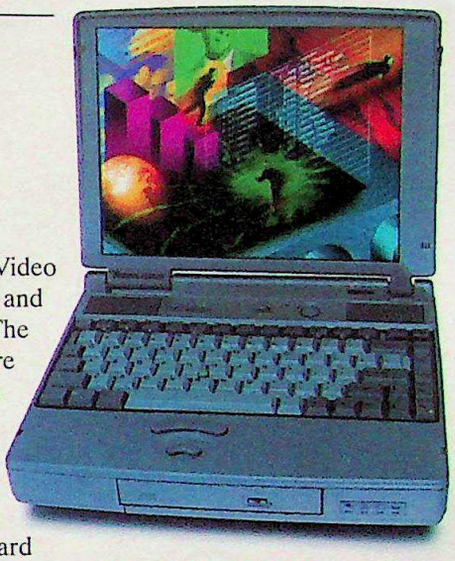
WORTH THE WEIGHT

To some extent, the Tecra 720CDT's prodigious size and weight are beside the point, because this system is the most fully equipped notebook to date. The main attraction is the notebook's 12.1-inch active-matrix screen, which consistently displayed crisp, bright, and rich images. While other notebook makers are just phasing in 800-by-600 resolution screens, the Tecra 720CDT offers the first 1,024-by-768 resolution display. The Tecra 720CDT's display can show 63 percent more information in stunning 16-bit color than an 800-by-600 panel, and it has a viewable area comparable to that of a 15-inch monitor.

Behind the screen is a Chips and Technologies HiQVideo F65550 video accelerator and 2MB of EDO RAM. The video chip features hardware interpolation for scaling in both the *x* and *y* dimensions, built-in YUK-to-RGB color-space conversion, and support for the PCI local-bus-burst standard for increased data throughput.

A true multimedia system, the Tecra 720CDT augments its cutting-edge video features with top-notch audio components, including a Sound Blaster Pro–compatible audio chip, a microphone, and two speakers. Although the recessed volume knob below the notebook's screen is more convenient than software controls, you'll have to get used to pressing down on the knob and

Continues on page 16



BIG SCREEN, BIG BOX: *The Tecra 720CDT is one of the heftiest notebooks around, but its video capabilities are unrivaled.*

Corrigendum

In the May 1996 issue of PCMI, on page 139, we had incorrectly mentioned Microland, Bangalore as Indian partner of Tripp Lite, Chicago.

The Indian partner of Information Dimension Inc is SRA Systems, No. 8/1 Pugh's Road, Raja Annamalaipuram, Madras 600 028. Tel: 459207; Fax: 4348879. The errors are regretted.

–The Editor

MULTIMEDIA AUTHORING

Macromedia's Director 5: At Home on The Desktop and on the Web

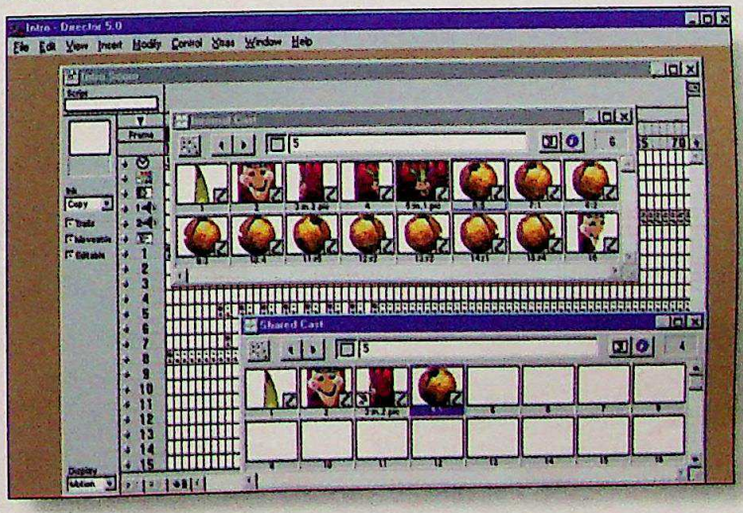
By Stephen W. Plain

Macromedia's Director has long enjoyed a reputation as one of the most powerful tools for professional multimedia development. The $850 Version 5 adds productivity enhancements that augment the program's standalone development features and provide new workgroup functionality. Director 5 can also be purchased as part of Macromedia's $999 Director Multimedia Studio 2.

Throughout this program, you'll discover dramatic performance improvements, tighter integration with the company's other products, and Internet possibilities.

Longtime Director users will feel right at home with Version 5, because there are no major changes to the interface or in the way you work with the program. The product continues to use the moviemaking metaphor, but the addition of new features and ca-

Continues on page 18



SUPPORTING CAST: *With Director 5's new support for multiple casts, you can share media elements with coworkers and make template-based movies.*

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Tecra 720CDT

Continued from page 15

turning it simultaneously to get it to work. An integrated mute switch would have been a welcome addition.

The Tecra 720CDT inaugurates the use of Zoomed Port Video (ZPV). Pioneered by Toshiba, ZPV streamlines the playing of video by funneling the data directly to the system's sound and graphics subsystems (see the sidebar "Zoom Will Add Zip to Notebook Video").

The trouble is that the technology is so young that, as of press time, we couldn't find any ZPV cards with which to test the system's video capabilities. By late summer, we expect to see the proliferation of ZPV cards for MPEG decoding, video capture, television tuning, and more. This approach contrasts with that of the ThinkPad 760CD's on-board hardware MPEG decoder or the Panasonic CF-41's MPEG module.

Even without the added boost of ZPV, the Tecra 720CDT did quite well at displaying .AVI and MPEG files that were played in software. Capable of displaying close to 30 frames per second at full screen, the system produced smooth clip playback and near-perfect sound synchronization.

ROAD WARRIOR SPECS

The Tecra 720CDT uses the fastest and most advanced processor made for portable computing, the 133-MHz mobile Pentium processor. The CPU's computational core runs at a power-saving 2.9V, while the I/O runs at the industry-standard 3.3V. The CPU is packaged on a paper-thin plastic tape and bonded to the motherboard's surface.

Like other Pentium/133 notebooks, the Tecra 720CDT lives on a 66-MHz motherboard. The Tecra 720CDT, however, sets the pace in terms of memory and external cache. With the advent of 128MB SIMMs, the Tecra 720CDT's motherboard can accommodate up to 144MB of EDO RAM. At about $10,000 this module costs more than the system itself, which should satisfy data-hungry users. The Tecra 720CDT comes with 16MB of memory standard. One innovation likely to be imitated by others is the integration of the Tecra 720CDT's 256K of external cache with the system's chipset. Theoretically, this should reduce the power drain from the cache SRAM chips without sacrificing performance.

Data storage is handled by the system's 2.5-inch hard disk, which can hold up to 1.3GB on its two platters. The key to the Tecra 720CDT's flexibility is its SelectBay modular housing, which can accept a 6X CD-ROM drive, the floppy disk drive, or a second hard disk. In a technique initiated with Toshiba's Satellite Pro series of multimedia systems, the floppy disk drive can be connected to a proprietary port on the right side when the CD-ROM drive or another peripheral occupies the bay.

BIG BATTERY

The Tecra 720CDT sets the pace in terms of battery size and heft, although at 21 ounces, the lithium ion battery alone is heavier than some hand-held computers. With an energy rating of 5.6 Amp-hours, the battery lasted about 2 hours on the WinDrain test with power conservation disabled; you can expect about 3 hours of stop-and-go computing.

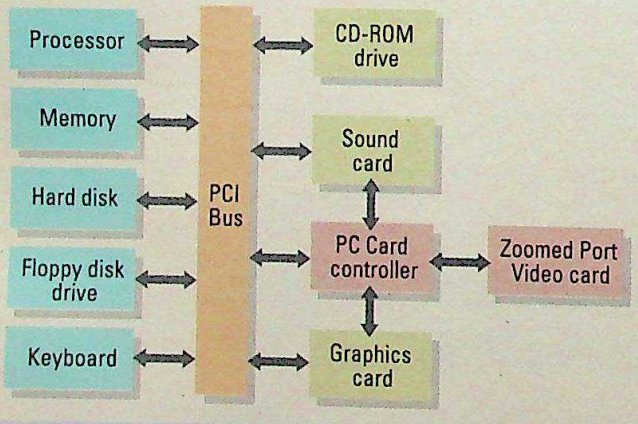
Although the Tecra 720CDT supports Windows 3.1, Windows 95, or Windows NT, if you choose the Windows NT path you will probably be disappointed. That's because you'll have to give up Toshiba's excellent MaxTime power management, full PCMCIA support, and support for infrared printing and file transfer. This is likely to change with the release of Windows NT 4.0 later this year.

Zoom Will Add Zip to Notebook Video

The biggest advance in notebook architecture in recent years is Zoomed Port Video (ZPV), a PC Card standard that can turbocharge a notebook's PC Card slot to help video-playback devices such as MPEG decoders produce full-screen, full-motion video playback.

Direct Connection

Zoomed Port Video streamlines graphics.



notebook PCs from the outset, ZPV is smaller and lighter. ZPV is essential for smooth playback of MPEG-1 or MPEG-2 video or playing video from a television tuner and especially for processor-intensive tasks such as videoconferencing.

For example, decompressed, 30-frame-per-second, full-screen MPEG-1 video requires a constant flow of about 27 megabytes per second (MBps). Traditional laptop architectures transmit this data over the system bus, bringing other processes to a standstill. In contrast, ZPV sends the audio/video data directly from the PC Card MPEG-1 decoder to the audio and graphics subsystems, reducing the load on the system bus and the processor.

ZPV uses the same address lines as the current PC Card specification, so new ZPV laptops will be backward-compatible with the installed base of PC Cards. But new ZPV cards won't enhance the performance of older, legacy laptops, as the new cards require support from the graphics and PC Card controllers and the appropriate circuitry on the notebook itself.

Like all specifications, ZPV's success hinges upon Toshiba's ability to garner support from card makers, which is impossible to assess accurately at this point. What is clear is that ZPV functionality is a step in the right direction and that by making the specification backward-compatible, Toshiba virtually eliminated the risk to early adapters.—*JO*

Toshiba, which introduced ZPV with promised support from vendors such as Cirrus Logic, Sigma Designs, Sony, and Texas Instruments, is pushing for the adoption of the new specification as a PC Card standard.

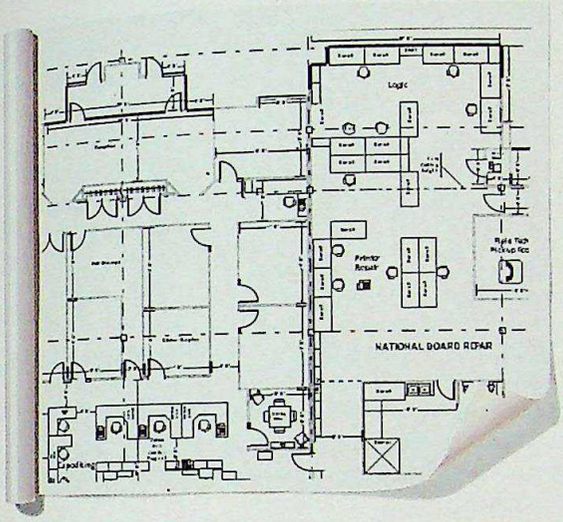
Briefly, the new architecture provides a direct high-speed connection between the PC Card slot and the laptop's audio and graphics subsystems. The key is that the video signals bypass the system bus and instead travel directly to the system's audiovisual components.

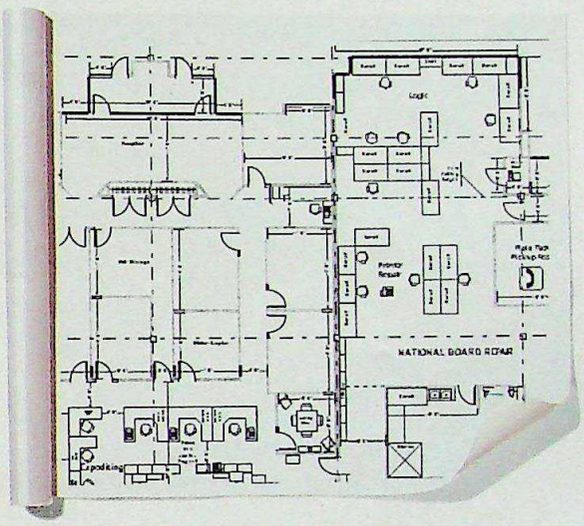
This concept is similar to the VESA Feature Connector found on most graphics cards, but it's much faster. And because it is intended for use in

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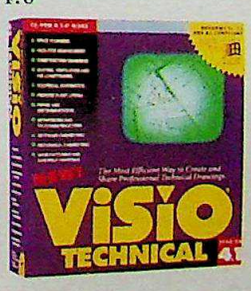
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BENCHMARK TESTS

Toshiba Tecra 720CDT

The Toshiba Tecra 720CDT posted solid scores on our tests, but its strong suit is clearly innovative video and multimedia features. In raw performance, the Tecra 720CDT lagged behind other Pentium/133 notebooks (First Looks, April 9, 1996). For example, the Tecra 720CDT was competitive with the AST Ascentia P50 and Micron Millennia TransPort P133 on the ZD CPUmark processor tests and ZD Graphics WinMark 96 tests but trailed on ZD Winstone 96, with a score of 46. Equipped with a 6X CD-ROM drive, the Tecra 720CDT posted a significantly higher ZD CD-ROM WinMark 96 score than the Ascentia and Millennia attained with 4X drives.

To measure the performance of the Tecra 720CDT, we used ZD Winstone 96, Version 1.0, and ZD WinBench 96, Version 1.0. We used ZD WinDrain to measure battery life. The system we tested was equipped with 16MB of RAM.

Higher scores represent better performance.	ZD Winstone 96 Score	ZD Graphics WinMark 96 Mpixels/sec	ZD Disk WinMark 96 Score	ZD CPUmark$_{16}$ Score	ZD CPUmark$_{32}$ Score	ZD CD-ROM WinMark 96 Score	ZD WinDrain Hours:min
AST Ascentia P50 (April 9, 1996)	54	12.2	673	257	259	365	2:34
Micron Millennia TransPort P133 (April 9, 1996)	54	12.3	781	250	256	364	2:04
Toshiba Tecra 720CDT	46	12.7	608	251	247	598	1:53

In a world dominated by PC Card modems, the Tecra 720CDT's internal V.34 modem is a refreshing change. The system includes an external RJ-11 phone plug, telephone answering-machine software, and full-duplex features for conferencing. At the moment, the Tecra 720CDT is locked into a maximum data throughput of 28.8 Kbps.

Toshiba's tradition of building some of the most responsive keyboards continues with the Tecra 720CDT. With its 19-millimeter key spacing, typing on the Tecra 720CDT comes as close to using a desktop keyboard as you can get with a notebook. Toshiba's familiar pointing stick, AccuPoint, is similar to IBM's TrackPoint III but not as intuitive to use as a touch pad.

The system comes with all the expected amenities, including support for IrDA infrared file transfers and printing. But you'll have to settle for the 115-Kbps transfer rate, because the Tecra 720CDT does not yet support the latest 4-Mbps standard. There's a Type III PC Card slot that, in addition to supporting ZPV, can handle the newest 32-bit Card Bus notebook peripherals.

DECISION MAKERS READ PC MAGAZINE INDIA

DOCK OF THE BAY

At $799, Toshiba's PCI-based docking station, Dock V, is a must-have option for those who divide their time between the office and the road. There's room for three PCI and two ISA cards as well as a 5.25-inch, half-height bay. The unit also includes a SelectBay module and a pair of Type II PC Card slots.

The system comes with an excellent instruction sheet for quick setup, an online help manual, and a get-acquainted demo program. Although short on productivity software, the Tecra more than compensates with an excellent set of multimedia-creationand -playback applications. The most intriguing are magiCDisc (for managing your CD-ROMs) and Puma Technologies' TranXit 2, the premier IrDA interface

With a CPU running at warp speed, processor meltdown is always a possibility; there's a small fan next to the plugs for the external microphone, speakers, headphones, and the keyboard or mouse. The fan never turned on during our tests, but the notebook's bottom did heat up and would have been uncomfortable to hold on one's lap.

All this cutting-edge technology added up to solid but not overwhelming performance on our benchmark tests. In terms of our CPUmark$_{16}$ and CPUmark$_{32}$ processor scores and Graphics WinMark 96 video result, the Tecra 720CDT was comparable to the Pentium/133-based AST Ascentia P50 and Micron Millennia TransPort. The Tecra 720CDT lagged behind both units on the Disk WinMark 96 and the all-important Winstone 96 tests.

For those who need to pinch pennies, there's the Tecra 500CDT, which trades the biggest and best for the merely advanced. It costs $5,000 and features a Pentium/120 CPU, 256K of external cache, and a 12.1-inch display with a resolution of 800-by-600. A passive-matrix–based Tecra 500CDS will sell for $4,000.

If you strive for the ultimate in video in a briefcase, look no further than the Tecra 720CDT.

Toshiba Tecra 720CDT. List price: With Pentium/133 CPU, 256K external cache, 16MB RAM, 1.3GB hard disk, 6X CD-ROM drive, 12.1-inch active-matrix display, $6,299. Toshiba America Information Systems, Irvine, CA; http://www.toshiba.com.

(Indian partner Teknotron Information Systems, 908 Chiranjiv Tower, 43 Nehru Place, New Delhi 110019. Tel: 6210264; Fax: 6473020; Price: Rs 550,000.)

Director 5

Continued from page 15

pabilities makes it a lot ... powerful and flexible.

The Windows version of ... tor 5 runs on Windows 3.1, ... dows 95, and Windows NT. ... is also a Macintosh version. ... Director 5, you can create ... 32-bit movies for Windows ... Macintosh or for publica... the World Wide Web.

Of course, Director 5 ... basic support for Macrom... Director-to-HTML conv... Afterburner, and the Shock... plug-ins for Netscape Na... 2.0 (see the sidebar "Di... Add-Ons Can Turn the W... a Silver Screen"). Both ca... downloaded from Macrom... Web site. With Afterburner ... can convert Director movi... highly interactive Web p...

ALL THE WORLD'S A STAGE

In Director 5, you create m... media movies by manipu... media elements, called cas... *bers*. The focal point for th... tivity is the Score window, ... you create the sequences ... synchronize the actions of ... cast members. Director 5's S... the end user's screen, is wh... action occurs.

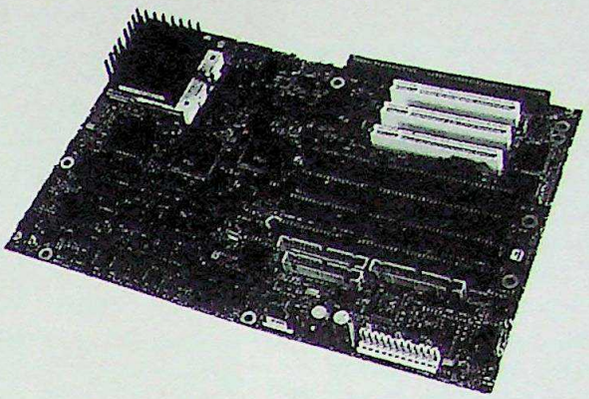
To choreograph a sequence ... dragged cast members fro... Cast window to the Score w... and dropped them into one ... score's 48 sprite channels. T... are other special channels ... your palettes, scripts, sounds, ... tempo changes.

This basic approach ha... changed from Director 4, bu... tunately, many of the oper... that you perform with the ... have been streamlined. Te... members have been improv... this version. Large text is ... matically anti-aliased relat... the background to smooth ... jagged lines. In previous ... sions, aliasing made it diffi... display diagonal lines. E... text is now bitmapped w... movie plays, and Macrom... has improved the program's ... importing capabilities. ... graphics cast members can ...

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include 24-bit graphics images.

One of the most interesting new features is called Onion Skinning. It allows the developer to position a ghosted image of other cast members beneath the current cast member to make subtle changes to an image or maintain consistent positioning of cast-member elements. In addition, you can now create bitmapped cast members as OLE objects and launch their native applications for editing from within Director 5.

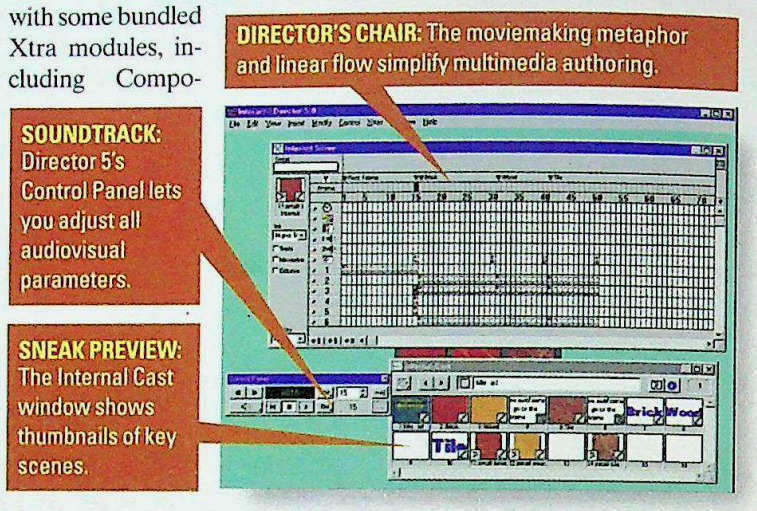
CAST OF CHARACTERS

One of Director 5's most powerful new features is support for multiple casts. This simple feature opens new doors for developers. For example, you can place a central external cast on a file server as a central repository for group development, organize your cast members according to media type, or switch casts on the fly with the program's sophisticated scripting language, Lingo.

For example, switching casts on the fly allows you to create boilerplate movies for broad commercial appeal or customize a single movie for multiple languages.

Director 5 requires the use of Lingo coding for all but the simplest of movies. The Lingo language's syntax is reasonably intuitive, since it's based on the syntax of the English language. Director 5 includes dozens of new Lingo commands and a new script debugger.

Version 5 also introduces what Macromedia calls Xtras, which is the name for an add-on technique that's more powerful than the previous version's XObjects. The key is that Xtras can be written in the programming language C and become add-on programs for Director 5, replete with their own interfaces. The basic product comes with some bundled Xtra modules, including Component Software's database, FileFlex.



Director 5 remains one of the most powerful products in its class. Its broad selection of animation techniques is unsurpassed, and its all-around moviemaking metaphor simplifies the creation of precisely timed and choreographed sequences.

As good as it is, Director 5 does not address the need for an alternative program-flow control scheme. Although Director works well for linear movies, it doesn't lend itself well to complex applications with branching and dependencies which are important features in computer-based training applications; the company's Authorware still dominates that field.

With Version 5, Director takes some significant evolutionary steps and becomes a much stronger tool for individual or group title development, whether the medium in question is a CD-ROM or the Web.

Director 5 for Windows. Estimated street price: $850. Requires 8MB RAM, 40MB hard disk space, Microsoft Windows 3.1, Windows 95, or Windows NT. Macromedia Inc., San Francisco; http://www.macromedia.com. *(Indian partners Macro Media, New Delhi; Wipro, Bangalore)*

Director Add-Ons Can Turn The Web into a Silver Screen

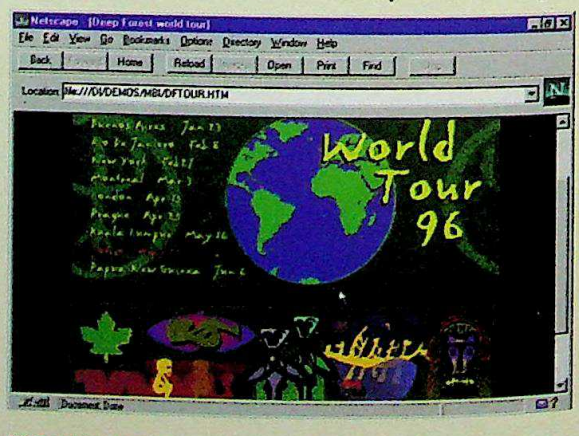
For multimedia developers who have focused mainly on kiosks and CD-ROMs, the Web is a huge untapped distribution medium. Macromedia's Shockwave software, first introduced as an extension to Macromedia's Director 4, has revolutionized the Web by bringing animation, interactive elements, and sound to static HTML pages.

The Shockwave software is critical to Macromedia's Internet strategy, and the company plans to bundle the programs with all of its multimedia development tools. Shockwave software is also available free from Macromedia's Web site at *http://www.macromedia.com*.

Shockwave consists of two components. The first, Afterburner, is a utility that compresses Macromedia movies for distribution over the Web. Previously a standalone utility, Afterburner will use the Xtras technology in Director 5 to provide tighter integration with the authoring program's interface.

The other component is the Shockwave plug-ins for Netscape Navigator 2.0, which allow users to view movies created in Authorware, Director or FreeHand. Macromedia has announced plans to develop versions for Microsoft Internet Explorer as well.

Many Web developers already use Director and Afterburner to add animated logos and graphics to their sites. Other developers are using Director to build promotional movies. Some of the sites that use Shockwave for Director include those for CNN, Netscape Communications Corp., MTV, *USA Today*, and the Walt Disney Co.



THE WEB LIVES: *Sony Music Entertainment uses Shockwave to create promotional pages with vivid animation and stirring sounds.*

Since movies that are compressed with Afterburner must download completely before they can run, dial-up access-speed limitations have discouraged more widespread use of Director movies on the Internet. As the bandwidth increases, though, you're likely to see more and more "shocked" sites.—*SWP*

Read **First Looks** for information on the latest product releases in India and the rest of the world.

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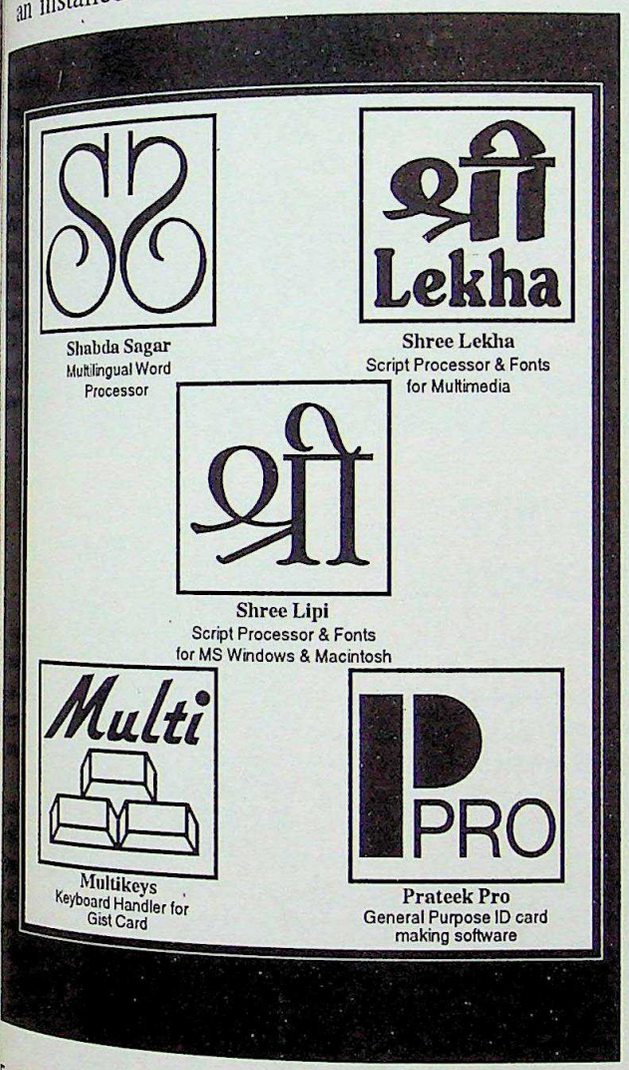
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Shree-Lipi . Shree-Lipi is an Indian Language script processor under MS Windows, with a collection of fonts and utilities compatible with both **IBM PC and Macintosh**. The ultimate in desktop publishing, it supports the largest collection of Indian typefaces in all Indian scripts and has a variety of keyboard layouts.

Avishkar : Avishkar is a **font styler** that can be used with Shri-Lipi to get virtually infinite font styles with condensation, expansion, outlining, about 180 serifs, envelope transformations etc. Currently Avishkar is available for Devnagri and Gujarati with 20 bonus fonts.

ShabdaSagar : ShabdaSagar is a DOS based **multilingual word processor** with commands that are similar to Word Star. User friendly to the core, it supports a majority of printers in use. Another attractive option is the availability of a variety of keyboard layouts.

Shree-Lekha : Shree-Lekha is a DOS based Indian language script processor available with **fonts for multimedia** video graphics. Its diverse features support various applications including Autodesk Animator & 3D Studio etc.

Prateek-Pro : A software package for preparing General Purpose Identity cards in Indian Languages, its applications can include Labels, Tags etc also. The package includes a simple data base editor, along with an image grabbing module, flexible layout designing & printing module for use in both B/W & colour photographs as well as text.

Multikeys : Multikeys is a DOS based keyboard layout handler for Indian Languages to be used with GIST cards. It allows the use of popular keyboard layouts like Modular, Godrej, Ramington etc. Also available is a program for generating user defined layouts.

For more details contact :

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INTERNET UTILITIES

WebAnalyzer: The Finder of Lost Links

By John Morris

InContext Systems is an Internet life preserver for those who are drowning in a sea of World Wide Web–site details. The $149 WebAnalyzer examines every node and can diagnose most common problems.

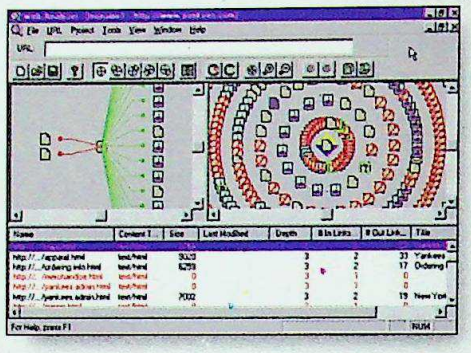
To analyze a site, all you need to do is enter its URL. The results, called Projects, are displayed in WebAnalyzer's three main windows: the WaveFront, Link, and File View.

WebAnalyzer's WaveFront view arranges the nodes as concentric rings showing the number of links away from the starting page. A series of icons identifies the nodes by MIME type: graphics, mailto: links, multimedia files, or text. You can right-click on specific nodes and select Properties to get more detailed information or view low-resolution thumbnails.

When you select a node in the WaveFront View, the Link View window to the left shows all the file's "in-links" and "out-links." At the bottom, File View lists every linked node by filename, type, size, date last modified, depth from the starting page, and number of links. You can sort on any of these headings.

WebAnalyzer had no trouble locating two out-links on a personal page to other pages that had not been posted. On larger sites, the program unearthed as many as 150 broken links. WebAnalyzer also contains customizable filters for viewing nodes based on file size or type or the status of the links—but not file date—to home in on problems.

When you create a new Project, WebAnalyzer caches all of the HTML documents and thumbnails to your hard disk; this can take up from 1MB to 15MB, depending on the site. Unlike Netscape Navigator, WebAnalyzer doesn't allow you to limit total caching, but you can limit downloads based on file type



RING OF FIRE: *WebAnalyzer's views show how far a page is from the home page and let you filter based on key criteria.*

(audio, pictures, or video). On a 486DX/33-based PC with 16MB of RAM and a shared T1 connection, it took from a few minutes to 45 minutes to download individual sites.

Once you find out what's wrong with the site, WebAnalyzer allows you to launch your browser and automatically jump to the page, open an HTML editor to view the underlying code, or generate a report. And if you've got the disk space, you can mirror the entire site for browsing off-line.

During evaluation, we found out that WebAnalyzer doesn't support aliased URLs. As a result, we had trouble using W... Analyzer to analyze some ... including PC Magazine On... A maintenance release, w... should be available at the ... pany's Web site (*http://w... .incontext.com*) by the time ... read this, will add alias supp... reduce system crashes, and ... port high-resolution thum... images.

WebAnalyzer is an ambi... and promising effort that c... bines Web management with ... line browsing.

WebAnalyzer. List price: $149 ... quires: 8MB RAM (12MB ... ommended), 3MB hard ... space, Microsoft Windows ... InContext Systems, Toro... Ontario, Canada; http://w... .incontext.com.

(No Indian partner.)

INTERNET SOFTWARE

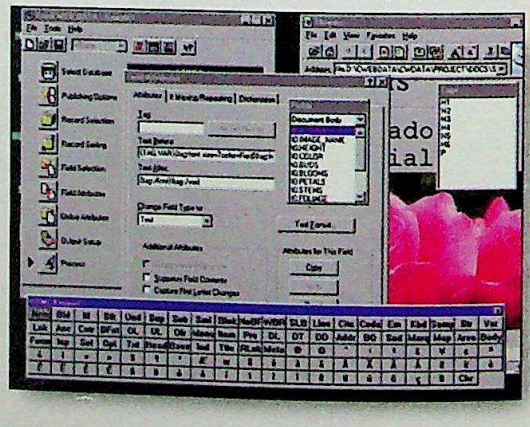
Corel Web.Data Delivers Instant Internet Databases

By Richard Dragan

With just a few minutes of work, Corel Web.Data 1.0 can transform a Web page into a data-rich source of information. To get the most out of this $149 product, you'll need to know the basics of HTML, but Web.Data's simple, elegant interface lets even Internet novices publish their data in a hurry.

The program's organizing concept is the Recipe, which is a template for producing a specific type of Web page. There are nine buttons, one for each tool used to create the Recipes. The process resembles that used by many database reporting tools, with a few extra steps for putting your data online.

Web.Data offers excellent connectivity to a wide variety of databases, including Access 2.0, dBase 5.0, FoxPro 3.0, Oracle, and Paradox 5.0, as well as Excel 5.0 and Lotus 1-2-3 spreadsheets; additional database connections are available through ODBC drivers. It's easy to create joins among tables, and you can add calculated fields based on other values in your tables.



HTML SHORTCUTS: *Set field attributes easily in Web.Data using its HTML Keypad tool, which allows you to apply more than 90 HTML codes.*

Start by choosing the page format: HTML 3.0, Netscape Navigator, or Microsoft Internet Explorer. Next, select which records and fields to display. Web.D... lets you build queries and ... records without worrying a... the intricacies of database d...

Web.Data's Field Attri... tool lets you choose a field ... control how it will appear. ... best results, you'll need to k... basic HTML coding. ... Web.Data's HTML Keypad ... lets you add common tags w... out typing them.

One indispensable fea... here is the ability to ... graphics linked to your W... pages effortlessly. If you refer... an image by filename in a ta... Web.Data will display it, wh... it is stored locally or on a re... URL. Common graphics for... such as .GIF and JPEG are s... ported. For more advanced ... matting, Web.Data also supp... the use of dictionaries that let ... translate values.

With its simple logical int... and strong connectivity, Web.D... may well earn a place in your ... nal of Web-design utilities.

Corel Web.Data 1.0. List p... $149. Requires: 8MB R... 20MB hard disk space, Mic... Windows 95 or Windows ... 3.51. Corel Corp., Ottawa, On... Canada; http://www.corel.... *(Indian partners Datapro Info... Pune; Svam Software, New ... Wipro, Bangalore; Price: Rs ...*

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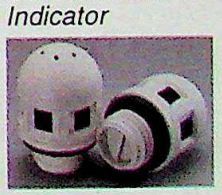
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PRINTERS

HP DesignJet 755CM: The Long And Short of Poster Printing

By Daniel Grotta and Sally Wiener Grotta

The $11,995 HP DesignJet 755CM, a large-format ink jet printer, takes a giant step toward making big prints and posters more affordable and accessible but fails to make the creation of billboard and poster-size prints an everyday output choice for most desktop users.

Make no mistake, this printer is not for the desktop—anyone's desktop. At 135 pounds and with the floor-space requirements of a table saw, the DesignJet is about as big and heavy as PC printers get. Fortunately, this printer, which is capable of producing 3- by 9-foot posters at 300 dots per inch (dpi) for color or 600 dpi for monochrome output, rolls easily on lockable wheels.

Even so, many will have difficulty finding enough space for this 54- by 27- by 47-inch behemoth. Placement of the printer's parallel port and power cables at opposite ends of the unit doesn't help either; many will find it slightly awkward and time-consuming to find a comfortable location for the DesignJet.

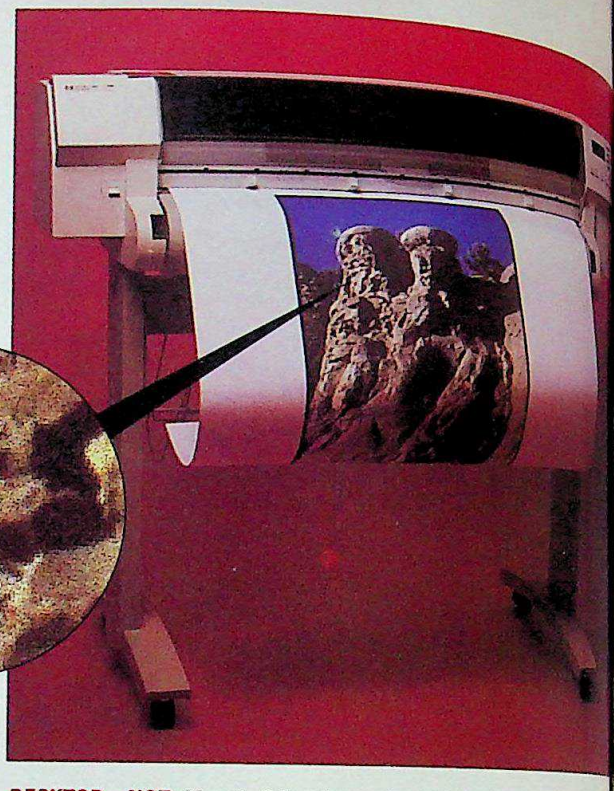
The process of assembling and setting up the DesignJet is neither a solo job nor a job for novices. It takes two physically fit people to bolt the DesignJet together, a task made difficult by the lack of complete written instructions or a setup booklet; HP provides a somewhat ambiguous illustrated assembly sheet.

After reading the documentation, we installed ink cartridges with the printer turned on; otherwise, the ink jets might fail prematurely. This is not an insignificant consideration for black cartridges that cost $32.95 and color cartridges that cost $39.95. All told, it'll cost you about $7 per page to print with the DesignJet.

The Achilles heel remains the ink's chemistry. Although HP chemists have improved its durability, even the best image will fade in about a year unless you put it in a frame with UV-protected glass or laminate it with a special coating.

Every time you install new ink cartridges, the DesignJet automatically performs an alignment check across the unit's entire inch carriage width. Each cartridge has a window showing how much ink remains, and the printer detects when it's empty.

Unlike the cartridges in some other large-format ink jet printers, HP's black cartridge has the same capacity as its cyan, magenta, and yellow cartridges and therefore may need more frequent replacement. HP further sells oversize cartridges that includes a provision for refilling the cartridges; third parties sell refill kits and large-capacity wells, however.



DESKTOP—NOT: *Nearly 5 feet long, the HP DesignJet 755CM is the monster of the ink jet printer market. Prints from the DesignJet 75 are detailed with crisp lines and rich colors (inset).*

EASY INFO

The DesignJet's LCD control panel displays easy-to-follow step-by-step English (or Spanish) instructions for a variety of functions, such as setting up the correct interface (parallel, serial, or 10Base-T Ethernet), loading paper, selecting the media type, setting margins, and printing a demo, among others. It also tells you such things as when to raise or lower the pressure wheels or straighten the paper. The printer-control buttons are

Magic Stretch Canvas: Instant Art

Rexam's Magic Artist Stretch Canvas is a creative alternative to printing on paper. The ink jet–ready canvas features a bright, shiny white textured surface specifically designed to interact with inks from printers such as the DesignJet 755CM. The look and feel are so much like those of real canvas that you may be tempted to give up your oil paints and brushes.

The canvas comes in 36-inch–wide rolls that are either 10 or 35 feet long, as well as a variety of single-sheet sizes. Unless you produce oversize prints (those that are longer than 48 inches), we suggest forgoing the roll's economy and buying the single sheets. That's because the canvas is 20 mils thick—too heavy to be cut by the DesignJet 755CM's built-in knife. Another problem with the canvas is the slight curl produced when the substrate is wound around the printer's 2-inch spindle.

Unfortunately, no large ink jet has the canvas media's characteristics stored in its media profiles. With some experimentation during our evaluation, we found that either coated glossy paper or coated glossy film selections produced the best results.

The inks dry instantly, so there's little chance for bleeding. Even at a resolution of 300 dots per inch, one can discern a tight dot pattern, even on the canvas' absorbent and irregular surface.

The effect produced by a suitable computer-generated illustration or photograph printed on Magic Artist Stretch Canvas is warm and beautiful and would be at home in any art gallery.

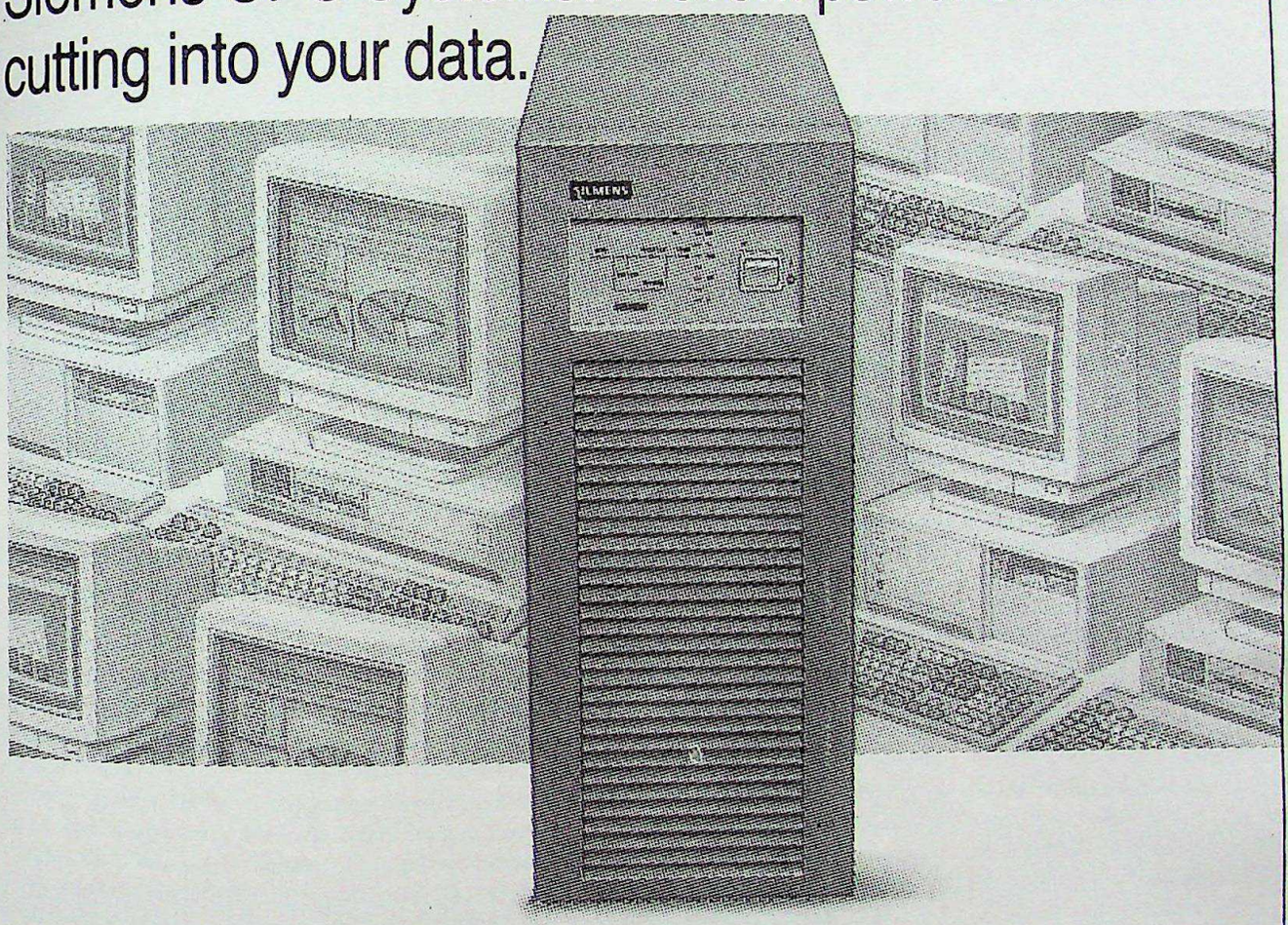
Magic Artist Stretch Canvas. List price: 35-foot roll, $330; 10-foot roll, $94. Rexam Graphics, South Hadley, MA. *(No Indian partner.)*

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and well marked, allowing the user to select color or monochrome and best, normal, or fast printing mode.

Paper handling for the DesignJet is sophisticated. The printer doles out paper from a long roll and after printing, the DesignJet trims it to the correct length; alternatively, you can use single sheets. Correctly loading paper into the DesignJet takes some practice, but once we figured out which way the paper should roll and how to cut the feeding edge properly on the unmarked recessed guide, we became quite adept at it. Because inserting a paper roll into the take-up spindle can be tedious and time-consuming, we suggest buying extra spindles (about $100 each) and preloading your rolls for faster media changes.

The DesignJet accepts a wide variety of roll stock or single sheets: high-gloss and semigloss coated stock, translucent and transparent film, matte paper, bond paper, tracing paper, and even vellum paper. There are even less-mainstream alternatives (see the sidebar "Magic Stretch Canvas: Instant Art") that others provide. It's important to select the correct medium on the DesignJet's display and the appropriate printer driver. If not, the printer will apply too little or too much ink.

HP provides drivers for Windows 3.*x*, AutoCAD, and the Macintosh but not for Windows 95 or Windows NT. The DesignJet can be installed as a standalone device or as a network printer. We had no problem setting it up to run under Windows for Workgroups. HP's Windows interface is utilitarian and uncomplicated, with automatic or manual color controls (vivid color, match screen, or no adjustment) as well as three choices of halftoning screens (scatter, pattern, or cluster).

To use HP's manual color controls, you must first roughly calibrate your monitor by eyeballing bars of color and using scroll bars to try to make them appear similar. The DesignJet got off to a rough start; because of a bad set of ink cartridges, our first batch of prints tended toward the magenta side of the spectrum. Subsequent prints with new cartridges produced consistent high-quality images across the 3- by 6-foot posters we printed. On the downside, vector files tended to be oversaturated with the default settings; we got better results when we turned off HP's color management.

The DesignJet comes equipped with PostScript and 71MB of memory (68MB is available for printing); you'll need a machine with at least 20MB of memory, although HP's minimum specification is 4MB. For the frugal, HP sells the $7,500 DesignJet 750C, which includes 4MB of RAM but no PostScript support.

SPEED IS OF THE ESSENCE

The DesignJet is remarkably fast: Our 67.7MB test TIFF file took 11 minutes 56 seconds to print, which translates to a rate of about 2 inches per minute. The unit printed vector images at a similar clip.

Despite being scaled up by a factor of more than 40, the printed images were consistently crisp and colorful, with clear, finely defined type and lines. Gradients were smooth and almost seamless, with little or no banding; dithering and dot patterns were unobtrusive. Only when you get close or magnify the output do you see artifacts. Even at 200 dpi, TIFF photo files printed with excellent detail and smoothness.

Although cost and size constraints limit the DesignJet 755CM to a small audience, this is a first-class piece of technology capable of producing impressive large prints and posters that in some cases can give presentations more impact than even big-screen projections could.

HP DesignJet 755CM. List price: With 71MB of RAM, $11,995. Requires: 4MB RAM, Microsoft Windows 3.*x* or later. Hewlett-Packard Co., Palo Alto, CA; http://www.hp.com. *(Indian subsidiary Hewlett-Packard, New Delhi; Indian partners CMS, Bombay; Godrej Trading, Bombay; ECIL, Hyderabad; HCL-HP, New Delhi; Price: Rs 543,000.)*

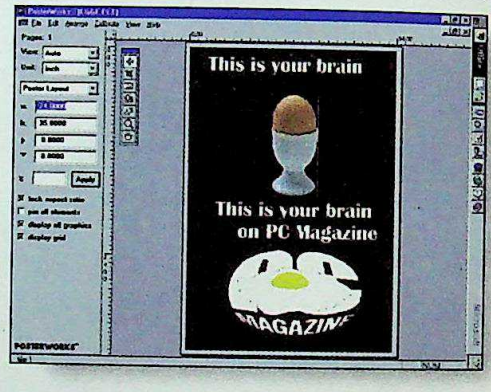
PRINTING SOFTWARE

PosterWorks: Graphics Images Living Large

By Arie Moller

If a picture is worth a thousand words, how many sentences is a billboard worth? If you wanted to print that billboard's worth of words, until recently you were limited to using platforms such as the Apple Macintosh or the Indigo workstation.

S. H. Pierce & Co. brings large-format printing capabilities—of up to 10,000 square feet—to the PC world with its $495 PosterWorks 4.0 for Windows. Based on 16-bit code, it is essentially a rewritten version of the original Mac program. The interface layout is standard fare, with pull-down menus on the top, a graphic-layout window to the left, and a layout-details window to the right.



FUNCTIONAL FRONT END: *PosterWorks' interface provides tools for producing posters.*

When starting a new project, you have two choices: You can either enter all the necessary layout options manually or be walked through the process using the built-in layout assistant, which describes the steps in eight languages ranging from Hebrew to Japanese. Be warned that once you answer a question in the assistant, there is no way to change your mind; you must restart the assistant and start from scratch.

Once your printer and basic layout information are entered, it's time to place the poster's elements. PosterWorks supports several file formats, including TIFF, Scitex CT, and PostScript's .EPS. To reduce memory overhead, PosterWorks uses a low-resolution of the original that can be re and moved for the layout win The program creates an inter pointer for the full-resolution inal when you're ready to pr

Printing options include mo chrome, color, or four-color se ration (cyan, magenta, yellow, black). Besides saving your lay as a PostScript file, PosterWor lets you export the layout to a stand BureauFile form

Although it's n designed to repla illustration program PosterWorks provide some rudimenta manipulation tool such as rotation a cropping. To ma final color adjustment PosterWorks provide direct control of color balance correctio curves for cyan, magenta, and ye low using a spline-curve grap

We found several areas that could stand improvement. First is the lack of a context-sensitive help file. PosterWorks' 340-page printed manual is adequate, but the program doesn't provide the easy access to the information that an online help engine does. In addition, you can't copy and paste or drag and drop objects into Poster Works from other programs via the Windows Clipboard.

PosterWorks is geared toward professional graphics artists who need large prints, but its results demand a larger audience.

PosterWorks 4.0 for Windows. List price: $495. Requires: 5MB RAM (8MB recommended), 3MB hard disk space (20MB recommended), Microsoft Windows 3.1 or Windows 95. S. H. Pierce & Co., Cambridge, MA; http://www.posterworks.com. *(No Indian partner.)*

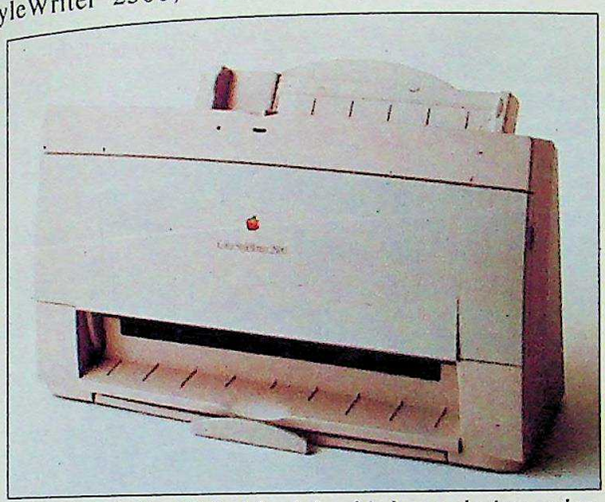
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INKJET PRINTER

Apple Launches Color Inkjet Printers for SOHO Market

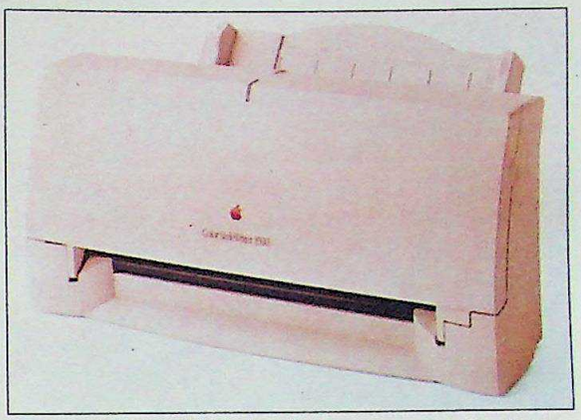
Apple Computer has announced two color inkjet printers for Mac systems. The printers target the home, education, and small business sectors. Color StyleWriter 2500, which bears a price tag of Rs 31,000, offers high-quality color and true black, high-resolution printing. Apple has also announced the availability of the StyleWriter Ether Talk Adapter, an easy-to-use printer networking device that allows Macintosh users to share StyleWriter or Color StyleWriter printers on an Ether Talk network.



Color Style Writer 2500: *Ideal for high-resolution color inkjet printing.*

Color StyleWriter 1500 and 2500 offer Apple Computer's popular Apple Stylewriter usability features, including desktop printing, the ability to print two or four reduced-sized documents on a single page, 64 True-Type fonts, and capability for dropping shaded or solid "water marks" on to the background of a page. Both printers support ColorSync 2.0, Apple's state-of-the-art color matching system that provides the closest possible match between the color on the monitor and the color that comes out of the printer.

Color StyleWriter 1500 (price Rs 28,500) is Apple's most cost-effective color printer for Macintosh. It comes complete with an all-in-one color ink cartridge, a black-only ink cartridge, and a series cable, enabling it to print color right out of the box. It offers laser-quality black and white printing at a resolution of 720 by 360 dpi, and 360 by 360 dpi for color and gray scale. Color StyleWriter 1500 offers near-laser speeds of up to three pages per minute for black and white, and 0.3 pages per minute in color.



Color Style Writer 1500: *Apple's most cost-effective color inkjet printer for the desktop.*

Providing high-quality color printing for the Macintosh, Color StyleWriter 2500 offers true black and vibrant color output at a resolution of 720 by 360 dpi. The printer automatically chooses the optimal ink density for the paper type selected, resulting in smooth, high-quality output. In addition to a color ink cartridge featuring a separate true-black ink tank, users can choose an optional high-performance black-only cartridge for convenience. Color Stylewriter 2500 features water-resistant ink for reliable quality, and offers exceptionally fast speeds of five pages per minute for high performance black and white printing, and 0.66 pages per minute for color. The StyleWriter Ether Talk adapter connects StyleWriter or Color StyleWriter printers directly to an Ether Talk network, eliminating the need to dedicate a Macintosh computer as a print server. The adapter requires no additional software, relying instead on the standard printer driver that comes with the printer. The adapter supports both 10Base-T and 10Base-2 Ether Talk local area networks, and offers five LED displays for monitoring the network connection status and easy troubleshooting. Printers supported by the adapter include Color StyleWriter 2400, Color StyleWriter 2500, Color StyleWriter 2200, Color StyleWriter 1500, and StyleWriter 1200.

Color StyleWriter 1500/2500. *Apple Computer International India, DU Parc Trinity, M.G. Road, Bangalore 560001. Tel: 5550573/74; Fax: 5550660.*

ROUTERS

Cisco Announces 7200 Series Multi-Protocol Routers

Cisco Systems, a global leader in internetworking solutions, has announced a new series of multi-protocol routers. The Cisco 7200 family consists of the four-slot Cisco 7204 and the six-slot Cisco 7206. Both routers support the full compliment of Cisco internetwork operating system (IOS) software services including NetFlow Switching. NetFlow Switching identifies traffic flows between internetwork hosts and then, on a connection-oriented basis, switches packets in these flows at the same time that it applies relevant services.

The 7200 series adapters support as many as 24 ethernet and 12 serial, or Token Ring ports. Cisco 7206 has a system capacity of 600Mbps and is powered by a RISC-based 150 MHz system processor that can switch 140,000 packets per second.

The devices offer routing capabilities essential for building reliable, scalable switched networks, and for moving traffic between virtual LANs. With Cisco IOS software, they support a wide range of routing protocols including IP, IPX, AppleTalk, and DECnet. They also support Cisco's inter-switch link (ISL) protocol for transporting VLANs across Fast Ethernet and the IEEE 802.10 standard for transporting VLANs over FDDI.

They also feature an embedded Fast Ethernet port and can be used with Cisco's catalyst LAN switches to deliver additional speed and port density.

The new routers will also support Cisco IOS network encryption services, which enable traffic to be encrypted using the private data encryption standard, and public key mechanisms. Remote users can thus transport confidential data across corporate networks or the Internet.

Cisco products are distributed in India by Wipro Infotech, Microland, UB Networks, Datacraft ICIM, Tata Unisys, and Apcom Computers.

Cisco 7000 Series. *Cisco Systems, Suite 119 Hyatt Regency, Bhikaiji Cama Place, New Delhi 110066. Tel: 6117688; Fax: 6117688.*

PLEASE SEND YOUR COMMENTS
ON THE INDIAN SECTION
TO THE EDITOR

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MULTILINGUAL WORDPROCESSOR

Modular Systems Launches Indian Language DTP Products

Pune-based Modular Systems, a leader in multi-lingual DTP software and fonts, has released four new software products in the Indian market. These are Shabda Sagar, Prateek Pro, Shree-Lekha, and Multi Keys.

Shabda Sagar is a DOS-based multi-lingual wordprocessor. Available in all Indian languages, the software provides two standard fonts per language, and offers a variety of styles including slant, expanded, bold, reverse, double strike, and underline. It incorporates a multilingual text editor with all standard commands including search and replace, block copy, alignment, header, footer, and so on. Print files can be created for remote applications.

The wordprocessor supports symbol fonts, rules, and boxes. The Hindi version of the software has a spell checker. An optional conversion utility for converting Shabda Sagar files to Modular's other software packages including Shree Lipi and Scriptmaster for editing in Windows-based packages like PageMaker is also provided. ShabdaSagar files can also be converted for e-mail operations.

Prateek Pro is a DOS-based general purpose ID-making software package for generating definable bilingual identity cards, labels, and tags. Available in English and all Indian languages, Prateek Pro can be used to print constant text on cards. Text from the database can be merged with the constant text. Scanned logos, horizontal and vertical rules, rectangular boxes, and photographs can be placed on the cards. Prateek Pro has a mouse-drive menu interface, a user-definable data structure for the database, a screen generator for creating data entry screens, a bilingual database editor, a module for image grabbing, and the facility to process images online. Shree-Lekha is a DOS-based script processor and fonts library for multimedia packages like Autodesk Animator Pro and 3D Studio. It offers an extensive library of Modular Systems fonts containing about 1,300 Indian language fonts. The in-built[illegible] board manager can be used [illegible] selecting the desired keyb[illegible] Shree-Lekha can be used in c[illegible] junction with animation [illegible] graphics packages to create [illegible] brant animations with text [illegible] Indian languages. The ani[illegible] tions can be transferred to v[illegible] tape with the help of compa[illegible] hardware.

Multi Keys is a keyb[illegible] handler for Modular Systems' [illegible] cards. It permits the user to [illegible] all standard keyboard layouts [illegible] to create his own keyboard l[illegible] out. Gist cards are used to k[illegible] text in Indian languages in D[illegible] packages.

Shabda Sagar, Prateek P[illegible] Shree Lekha, Multi Keys. *M[illegible] ular Systems. 26 Electronic [illegible] tate, Pune-Satara Road, P[illegible] 411009. Tel: 212 437994; F[illegible] 212 452323.*

HARD DISK DRIVE

Quantum Boosts 5.25" Form Factor with Bigfoot Family Additions

Quantum Corporation, a leading manufacturer of mass storage solutions including hard disk drives, has introduced two 5.25" hard disk drives belonging to the company's Bigfoot family. The drives fit into the bays of desktop PCs and provide 1.2GB (one disk) and 2.5GB (two disks) of storage capacity respectively.



Quantum Bigfoot 1.2/2.5: *Suitable for the home PC market.*

The technologies incorporated in the drives ensure that they can be manufactured easily. The 3,600 rpm drives feature proven technologies like magneto-resistive heads, partial response maximum likelihood (PRML) read channels, high speed interfaces, value-added features to meet the requirements of users, thin film recording heads, motor drive circuitry, and microprocessor and firmware technologies. Other features include a 128K buffer, auto-transfer technology to speed up data transfer, multiple auto-read and auto-write firmware to allow multiple sector transfers, and a 150-bit double-burst error correction for increased data integrity. They also support the self-monitoring, analysis, and reporting technology (SMART) system, an advanced industry-standard diagnostics feature for hard disk drives.

The Quantum Bigfoot 1.2/2.5 drives target the home PC market. They utilize the traditional 5.25" footprint (8" x 5.75"), but have a vertical height of only 0.75", and are intended for use in desktop or pedestal PC systems. The drives easily mount in virtually all mass storage bays without additional hardware, and can be used as a primary or add-in unit. They provide high-speed data throughput performance through a Fast ATA-2 interface which supports data transfer rates of up to 16.6Mbps.

Quantum Corporation has also announced three drives belonging to the 3.5" Fireball fa[illegible] ily, and two high-capacity dri[illegible] in the Viking series.

Quantum products are d[illegible] tributed in India by Bangalo[illegible] based Spectra Innovations [illegible] dia.

Quantum Bigfoot 1.2/2.5. *Sp[illegible] tra Innovations India, S[illegible] Manipal Center, 47 Dicken[illegible] Road, Bangalore 560042. Te[illegible] 5588323/3977; Fax: 55867[illegible]*

SCADA APPLICATION

Bellman Data Launches Wizcon 5.0

New Delhi-based Bellman Data has introduced Wizcon 5.0, a PC-based software developed by PCSOFT International of Israel. The package has innovative graphics presentation tools and employs advanced techniques for presenting graphics. It allows the image to consist of more than 64 layers, each layer representing specific information.

Wizcon's flexible charts provide graphical views of process behavior and operational trends over a period of time. More than 15 related process parameters can be configured on an X-Y chart, and it allows scrolling along the X and Y axes while zooming in and out to view the desired de[illegible] tails.

When exceptional even[illegible] occur, Wizcon selectively sen[illegible] alarms to special files, pop-[illegible] windows, images, and printe[illegible] Several alarms can be han[illegible] simultaneously, and can be fi[illegible] tered or sorted. The alarm w[illegible] dow could be divided accor[illegible] to zones, names and priorities

Wizcon runs on Windo[illegible] 95, NT, OS/2 Warp. It can de[illegible] er results compatible to expe[illegible] sive mini-computers and distr[illegible] uted control systems (DCSs).

Wizcon 5.0. *Bellman Da[illegible] CFF7 Jumbo House, Ok[illegible] Phase III, New Delhi 110[illegible] Tel: 6917392; Fax: 462615[illegible]*

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ADAPTER

Xircom Launches Fast Ethernet Adapters for Portable PCs

U.S-based Xircom has announced two 100 Mbps Ethernet adapters for connecting portable PCs to 100Base-TX Ethernet networks.

The CreditCard Ethernet 10/100 and CardBus Ethernet 10/100 adapters were developed by Xircom to solve the network bandwidth problems of portable PC users running network-intensive applications such as CAD/CAM, imaging, and database access.

CardBus Ethernet 10/100 adapter will provide 100Mbps connectivity for the new generation of CardBus-based portables. Portable PCs equipped with a 32-bit CardBus slot can take full advantage of the bandwidth provided by Fast Ethernet networks, enabling them to realize network throughput of up to 60 to 70Mbps. Like the CreditCard Ethernet 10/100 adapter, the CardBus adapter also operates in 10Mbps Ethernet mode in environments in which a Fast Ethernet network is planned but not implemented, providing a migration path to high-speed Ethernet networking while protecting the user's technology investment.

The two adapters incorporate features like an auto-detect program that automatically detects the Ethernet connection rate and adopts the speed of the network port to which it is attached; full duplex Ethernet networking; a Windows-based installation program that automatically configures the PC and the network operating system directly; a simple network management protocol (SNMP) agent for system management from any SNMP-based management station; support for hot-swapping of PC cards; a suite of NOS drivers; support for popular portable brands; support for all major card and socket services software; and 100Mbps Ethernet hub and switch compatibility testing.

Xircon develops and manufactures a comprehensive range of network access solutions for mobile and remote portable computer users.



CreditCard Ethernet 10/100: *100Mbps adapter for linking portable PCs to 100Base TX Ethernet networks.*

CreditCard and CardBus Ethernet 10/100 adapters. *Xircom Asia Pacific. #13-03 Cecil Court, 138 Cecil Street, Singapore 069538. Tel: 65 3231511; Fax: 65 2243313.*

INVESTMENT APPLICATION

Software for Share/Debenture & Fixed Deposit Management

New Delhi-based Eastern Software Systems has developed SharESS, a client/server share, debenture, and fixed deposit management system based on Oracle and Forms 4.5. The package is part of a comprehensive software package called MakESS, which caters to the needs of manufacturing companies. The other modules available under MakESS include financial accounting, sales and order management, production planning, production, world in progress, purchase, inventory, despatch, human resources, and payroll.

The share/debentures module takes care of all share/debenture-related activities like market price entry, transfer, stop transfer, change date of transfer, reports, transmission of certificate, splitting of certificate, consolidation of certificate, issue of duplicate certificate, call money payment entry, and reconciliation of payment. For shares, it also takes care of rights issues, AGM attendance entry, bonus share allotment, forfeited share entry, and generation of various reports like transmitted shares report, split shares report, consolidated shares report, duplicate shares report, rights issue allotment report, and bonus share allotment report.

The fixed deposit module deals with all fixed deposits-related activities of the company. The dividend module allows the user to calculate the dividend amount as well as generate dividend warrants for fully paid and partially paid members. This module has features including tax exemption entry, stop dividend warrants, dividend calculation, RBI statement entry, and TDS certificate. It also generates reports like dividend distribution report, deferred dividend report, distribution schedule, income tax exemption claim report, and unpaid/unclaimed dividend statements.

The interest module allows the user to calculate the interest due for debentures and fixed deposit holders.

The secretarial print module handles all printing tasks related to secretarial activities like mailing labels, signature cards, dividend warrants, share certificates, attendance register, and endorsement slip.

The reports module enables the user to generate several reports that help monitor the functioning of the share department. Reports can be printed on matters like list of present/past shareholders, payment status report, paid members list, partly paid shareholders list, categorized list of shareholders, members' register, index register, master change information report, and list of sellers/buyers.

The MIS reports module provides special reports required at top level of enterprise management. These include activities of top shareholders and annual return form. These reports are maintained because the management may be interested in keeping track of the top shareholders—for instance, how often they are transacting the shares, the types of transactions they are carrying out, and with whom they are transacting. This helps the management in analyzing the vested interests of the top shareholders.

The share parameters module defines variables and inputs basic information used throughout the system. The parameters include share parameters, status of the member (category), dividend declaration, bonus share declaration, rights issue declaration, tax limit-dividend, payment mode, checklist for share transfer, checklist for transmission, reasons for stop transfer, reasons for stopping dividend warrant, allotment declaration, tax exemption form, type of correspondence, share transfer meeting, share type, date and price format, and print parameters.

The SharESS correspondence module takes care of all the correspondence received and dispatched by the company including covering letter, forfeited notice, endorsement on certificate, ownership verification letter, rejection/objection and rectification of share, letter of office, rights issue, general correspondence, and postal expenditure.

SharEss is a user-friendly package and has a graphical user interface supported by Windows 95. It will be of considerable help to corporate finance and accounting departments, as well as to the management.

SharESS. *Eastern Software Systems, D16/2 Okhla Industrial Area, Phase 2, New Delhi 110020. Tel: 6821482/6821483; Fax: 6837805.*

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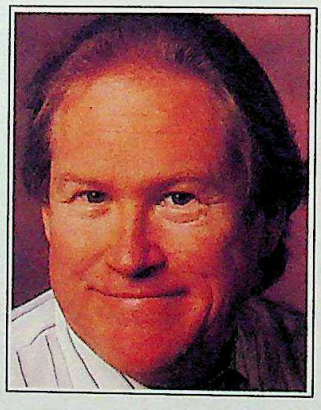
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Java: A Born Loser

It's hard to stand against the tide when everyone is boosting Java, but someone has to do it. Looking over the trends that have put personal computing on the fast track, I simply do not see where Java fits in. The major trend has been decentralization, and Java, in its purest form, runs counter to that.

For the most part, the promoters of Java come from a minicomputer mindset. Minicomputers have their place, but it's definitely not on the desktop. And I believe Sun, with a staff that is going gaga over Java, is basing its enthusiasm on a false premise.

At a recent Sun gathering, CEO Scott McNealy made an interesting observation about the direction of computing. The way he sees it, the world started out with big machines and quickly progressed to multiuser computing using the big machines. This evolved into minicomputers, with networks of users working off the minicomputers. Soon the microcomputer evolved and, with the rise of the Internet, followed the path of minicomputers, so that we have a central network again. In other words, in McNealy's estimation, things have essentially folded back a layer. The arrow of progress has reversed itself.



OUT OF STEP

Each step takes us further from centralization. The notion that Java will reverse this is a fantasy.

To me, this is disturbing. I don't believe that the evolution of personal computers would suddenly reverse course. Here's a more logical version of events: The world started out with big machines and quickly progressed to multiuser computing off the big machines. This evolved into minicomputers and LANs. Soon the microcomputer evolved, which continued to evolve away from the minicomputer model with the development of the WAN. In other words, personal computing has progressed from centralized to more and more decentralized: Mainframe to multiuser to mini to LAN to micro to WAN. This makes more sense. The next stage will be wireless computing and eventually radio frame-relay "cloud" technology. Each step takes us further away from centralization. There is no going back.

The notion that something like Java will come along and somehow magically reverse this trend is wishful thinking on a grand scale. Yes, Java will be used for dinky mini-apps (writer/programmer Rob Hummel calls them "craplets") and as a way to add animation to stagnant Web pages, but not for much more. I do suspect that Java will find some success as a way for programmers to write code for intranet applications. But it will hardly trigger a mass exodus from the current model for complex, application-oriented desktop computing.

When promoting Java, McNealy will tell you that a word processor doesn't need more than five functions. This, to me, indicates he's ignoring yet another trend, the development of programs of increasing depth and complexity. Imagine a situation in which you have two word processors: One has 2,000 distinct functions, 1,500 of which you will probably never use; the second has only 1,000 distinct functions, 500 of which you will never use. Both are the same price. Which one will sell more copies? What if they are both free? Or if one is free? No matter how they are priced, users will pick the more complex product. It is a trend that cannot be ignored. Java attempts to throw this idea into the dumper.

And let's not leave good old Microsoft out of this formula. It has essentially thrown most of the company's resources at the Internet and even, in a panic, licensed Java. What do you think Microsoft, a company known for language development, is going to do about Java? I'd look for Visual Java, then Visual Basic/Java, then Visual Basic for the Internet, and who knows what else. Java will be eased out of the picture as fast as possible. Any creative use for a technology such as a network-centric language will come from end users, who seldom want to code in a C++ type of language, which is what Java boils down to.

Finally, let me just throw one more wet towel on Java by commenting on its utopian notion of machine independence. This desire for interoperability is a joke. What's the point if 90 percent of desktop computers are Intel machines? I had to laugh when someone recently said they would be doing special Intel-optimized extensions to Java. Sheesh, the thing hasn't even gotten off the ground, and the notion of machine independence is already threatened.

For all these reasons, the whole notion of a return to centralized computing with the Java language will degenerate quickly. It's simply too retro to become important.

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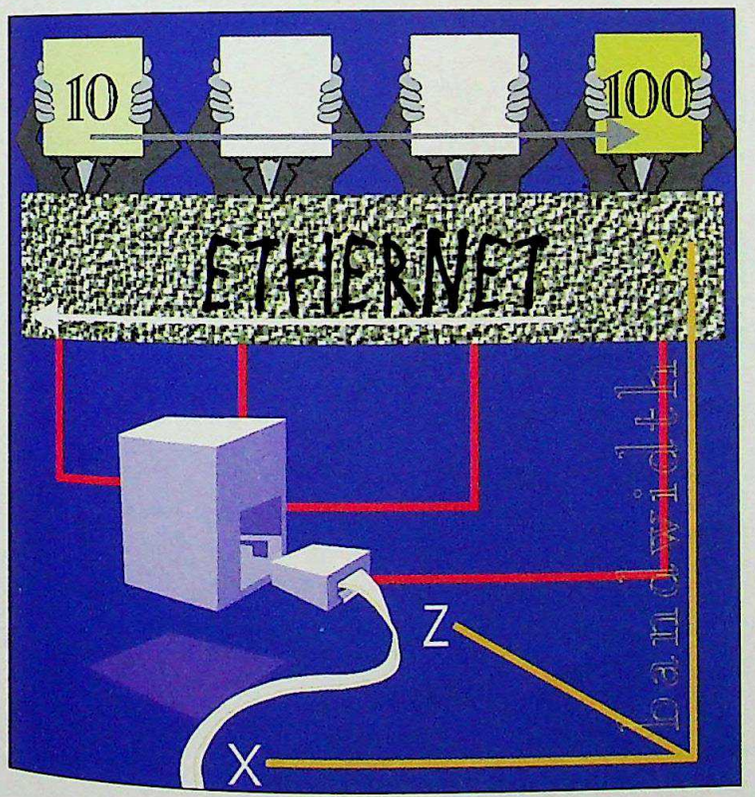
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Cover Story

HIGH-SPEED TECHNOLOGIES

The New Ethernet

It's not your father's Ethernet. Today you can choose from 10-Mbps switching and 100-Mbps solutions. Which of these approaches is best for you?



By Frank J. Derfler, Jr.

You can't just say "Ethernet" anymore. Bandwidth-chewing video and audio applications, banks of high-speed WAN connections, and the need to segment network traffic are driving changes to the familiar Ethernet. Companies such as Kalpana (now part of Cisco Systems) and consortiums such as the Fast Ethernet Alliance created technologies and products that embroider new

INSIDE

PC MAGAZINE

Deciding when to make the move to a faster technology is one of the trickiest decisions in network computing. You're betting that some new (and cheaper) approach isn't going to supplant your latest hero as soon as you slap down your money.

IN THIS ISSUE, WE GIVE you some guidelines on when and how to adopt Fast Ethernet, the hottest-selling high-speed networking technology. Frank Derfler, our senior networking editor and all-around connectivity guru, lays out the decision-making process. Whether you should go with 100Base-TX or -T4 or -FX is largely a function of the quality of your installed cable plant and your current and anticipated needs.

IN FIRST LOOKS, JEFF WITT, the project leader who runs testing for our big comparative network roundups, reviews a product that could be a harbinger of future networking. DirecPC is a satellite-based WAN solution for connecting your PCs to the Internet or to other businesses.

STEVE BUEHLER, DIRECTOR of PC Labs, West Coast, gives us a first look at NetWare 4.1 SMP. He says it's evolutionary, so don't expect revolutionary performance results on file and print services.

ALSO CHECK OUT ROB LIPSCHUTZ, tech director/networking, in Multiple Access this issue for advice on some new tools you should have on hand to help you with your fast new pipes and connected users.

—Gail Shaffer

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capabilities into the proven Ethernet fabric. The bag of tools and technologies that we call the New Ethernet provides options that can incrementally and economically meet the needs of data-driving applications in LANs of all sizes.

The elements of the New Ethernet include switching, 100-Mbps adapters and hubs in two basic types, and a competing technology called 100VG. It's not technically correct to call ATM a relative of Ethernet, but ATM certainly extends and augments Ethernet LANs.

SWITCHING DATA

The easiest way to improve the throughput for high-traffic nodes like graphics workstations and servers is to replace the hub in the closet with a switched Ethernet hub. Switches allow each node to use the cable without contention because they buffer incoming data and then send it out to only the designated destination node when that node's outgoing port is open. In effect, a switch changes Ethernet from a contention broadcast system to a direct delivery system. The benefits are immediate and you don't have to make any changes to the cabling system to benefit from switching. Importantly, switching also benefits PCs with ISA bus and laptops with PC Card LAN adapters—computers that can't benefit much from fast connections.

Switches are available for both 10-Mbps and 100-Mbps Ethernet. The 100-Mbps switches find particular value as a traffic control point for the connections between a cluster of servers and multiple workgroup LANs. If you have throughput problems, think 10-Mbps switches first.

THE 100-MBPS OPTIONS

While 10-Mbps switching is a basic building block of improved performance, some systems need more. If you have high-performance LAN nodes, including RISC-based, Pentium, and Pentium Pro computers, then they can take advantage of the throughput offered by 100-Mbps LAN adapters, hubs, and switches. You really need computers with the PCI bus or Sun's S-bus to get much benefit from 100-Mbps schemes.

Our testing for this issue focus on an emerging and useful set of products: 100-Mbps adapters and hubs, called 100Base-T4, that can use the same type of LAN cable originally installed for 10Base-T equipment. In case you need high throughput connections—even for a few nodes or a sub-LAN in an existing system—these 100Base-T4 products can provide them.

10/100 Decision Grid

Your move from 10-Mbps shared Ethernet toward 10-Mbps switched, 100-Mbps shared, or even 100-Mbps switched Ethernet depends on your users' needs and your priorities.

	Shared	Switched
10 Mbps	**Where deployed: desktop** Pros: Inexpensive and no changes required. Easy management. Cons: Network bottlenecks. Limited scalability. Pricing: $75 per adapter, $50 per port.	**Where deployed: desktop, server** Pros: More bandwidth at minimal expense with no client changes. Cons: Harder to manage. Limited to 10 Mbps for each desktop or server. Pricing: $75 per adapter, $200 per port.
100 Mbps	**Where deployed: server, desktop** Pros: Ten times the performance at three times the cost. Easy management. Cons: Potential congestion on a shared network. Pricing: $125 per adapter, $200 per port.	**Where deployed: backbone** Pros: All the bandwidth you may ever need. Cons: Very expensive. Pricing: $125 per adapter, $800 per port.

Three specifications for Fast Ethernet control today's market: 100Base-TX, 100Base-FX, and 100Base-T4. Another slightly different specification, called 100VG, is a competitor to the Ethernet family. The key difference among the 100-Mbps products is in the kind of cable they use, and cabling availability and investments will control your use of each technology.

> You really need computers with the PCI bus or Sun's S-bus to get much benefit from 100-Mbps schemes.

The 100Base-TX products depend on a high-quality cable installation that meets the standards called Category 5, established by the EIA/TIA and other certification organizations. In many cases, this requirement means that you need to pay for a new cable system installation if you want to move from 10Base-T to 100Base-TX.

The 100Base-FX specification calls for fiber optic cable. The 100Base-FX systems shrug off radio frequency interference and can extend connections out to over a mile of cable. Although many applications justify their cost, the pieces and parts for a fiber installation are costly. For example, a new fiber-cable installation can be two or three times as expensive as that of a new Category 5 cable installation. 100Base-FX has gained acceptance in finance, energy production, and other application areas that can pay for top performance and reliability. In more humble venues, its long-distance reach makes 100Base-FX a good LAN backbone technology.

But both 100Base-TX and 100Base-FX can drive costly LAN cable system upgrades. Adapters conforming to 100Base-T4 can operate over any Category 3, 4, or 5 copper wire. This flexibility allows network managers the ability to offer 100-Mbps LAN connections no matter what cable plant is installed. But are you getting something for nothing? No, clearly not. 100Base-T4 requires four pairs of wire for each node to attain its speed over these cable types. Since LAN data cables only contain four pairs, you are betting that every wire and every connection in every cable is good. That's often a long shot.

Many of the 100Base-TX vendors are shipping or plan to ship adapters and hubs conforming to both specifications. Because 100Base-T4 uses the same Ethernet packets as the other 100Base-T solutions, no extra bridging hardware is necessary when mixing 100Base-TX and 100Base-T4 hubs in the same stack. Some 100Base-T4 hubs will integrate both 100Base-TX and 100Base-T4 ports to accommodate both technologies.

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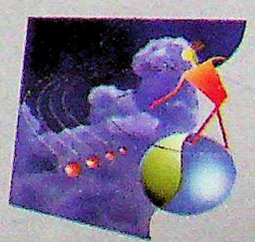
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THE 100VG ANYLAN ALTERNATIVE

Fast Ethernet is not the only 100-Mbps LAN technology available. Hewlett-Packard and a few other companies offer products conforming to a technology called 100VG (100 voice grade) AnyLAN. The primary advantage of 100VG is a feature called Demand Priority Architecture (DPA). 100VG transmits data over four pairs of UTP, but DPA provides a way for some applications, such as videoconferencing, to get priority service from the hub.

KNOW YOUR CABLE SYSTEM?

If you want to use any fast networking scheme other than switching, you must know a lot of details about your installed or planned cable system. Both 100Base-TX and ATM require a Category 5 cable installation. If you have an investment in Category 3 cabling, you still need a detailed survey of your cable system to insure that you have enough pairs of cable going to the right places.

A cable system is a lot more than just the wire. Standards such as Category 3 and Category 5 define the resistance to signals leaking between pairs—called near-end crosstalk (NEXT)—and the ability of the wire to pass signals at different frequencies—the frequency attenuation curve.

Everything in the path from the client adapter to the wiring closet, including punch-down blocks (if installed) and patch panels and patch cables, which make up the cabling plant, must adhere to the standards. If any of these pieces is not up to snuff, then be prepared to deal with some network problems. Simple things make big differences; for example, installers might unravel the twisted pairs too much, degrading the signal and reducing the electrical cancellation between wire pairs.

Without knowing the quality of your cable plant, you can't make an informed decision about what Fast Ethernet solution is right for your installation.

SO HOW DO YOU KNOW?

As with most things, you can either hire somebody to do it or do it yourself. If you want a new Category 5 or fiber-optic cable installation so you can use 100Base-TX and 100Base-FX, you'll want to use professional installers. Make sure, though, that they provide you with documentation such as wire maps and profile curves—printouts showing the near-end crosstalk and attenuation.

But, if you want to use 100Base-T4 or 100VG technology, you can probably do the survey yourself. You'll need a cable tester from a company such as Fluke, Microtest, or Scope. The testers will show you whether your installed cables meet Category 3 or 5 specifications. But most importantly for 100Base-T4 and 100VG buyers, they'll tell you if all the cable pairs are available and in the right order in the plug. Out-of-order and crossed pairs are common problems.

The following reports and tables provide you with the tools to make some smart decisions from the world of the New Ethernet.

10/100 Adapters

ALL SECTIONS BY PADRAIC BOYLE

Fast Ethernet is here to stay. Even if you do not plan to install it soon, you should think seriously about purchasing a Fast Ethernet adapter. Better known as 10/100 adapters, these products are designed with both 10-Mbps and 100-Mbps silicon onboard. This allows you to buy now and easily upgrade your LAN later by merely replacing the hub or switch in the wire closet with a Fast Ethernet hub or switch. With pricing comparable to 10-Mbps adapters, buying Fast Ethernet adapters now is a good idea.

Besides offering two speeds, a majority of Fast Ethernet adapters come with drivers and provide a single port with the capability to switch or negotiate automatically between 10-Mbps and 100-Mbps connections without any modification on the client side. Unfortunately, some 10/100 adapters provide two separate ports, one for 10 Mbps and the other for 100 Mbps, requiring you to visit each client and manually change connections.

When we put these adapters to the test, we found that a 1K block size rendered an average throughput of 70 to 75 Mbps between the server and multiple clients. One problem we observed was that some adapters relied almost 100% on the CPU, hindering its ability to perform other functions for the NOS. SMC EtherPower 10/100I PCI, for example, moved 1K blocks of data at 77 Mbps with 96% CPU utilization compared with Intel's EtherExpress PRO/100 PCI adapter's 76-Mbps throughput and 52% CPU utilization. We found that an adapter's driver sophistication can greatly affect performance and CPU utilization numbers. In short, the better the drivers, the better the numbers.

Many of the today's servers come with PCI and EISA buses. We found that PCI not only performs better and has lower CPU utilization, it costs less ($169 compared with $299). Considering its speed and flexibility, we feel the PCI-dominant bus structure is superior to EISA. For servers that offer only three PCI slots, adapters such as Cogent's EM400 TX Quartet offer four individual 10/100 ports on one adapter.

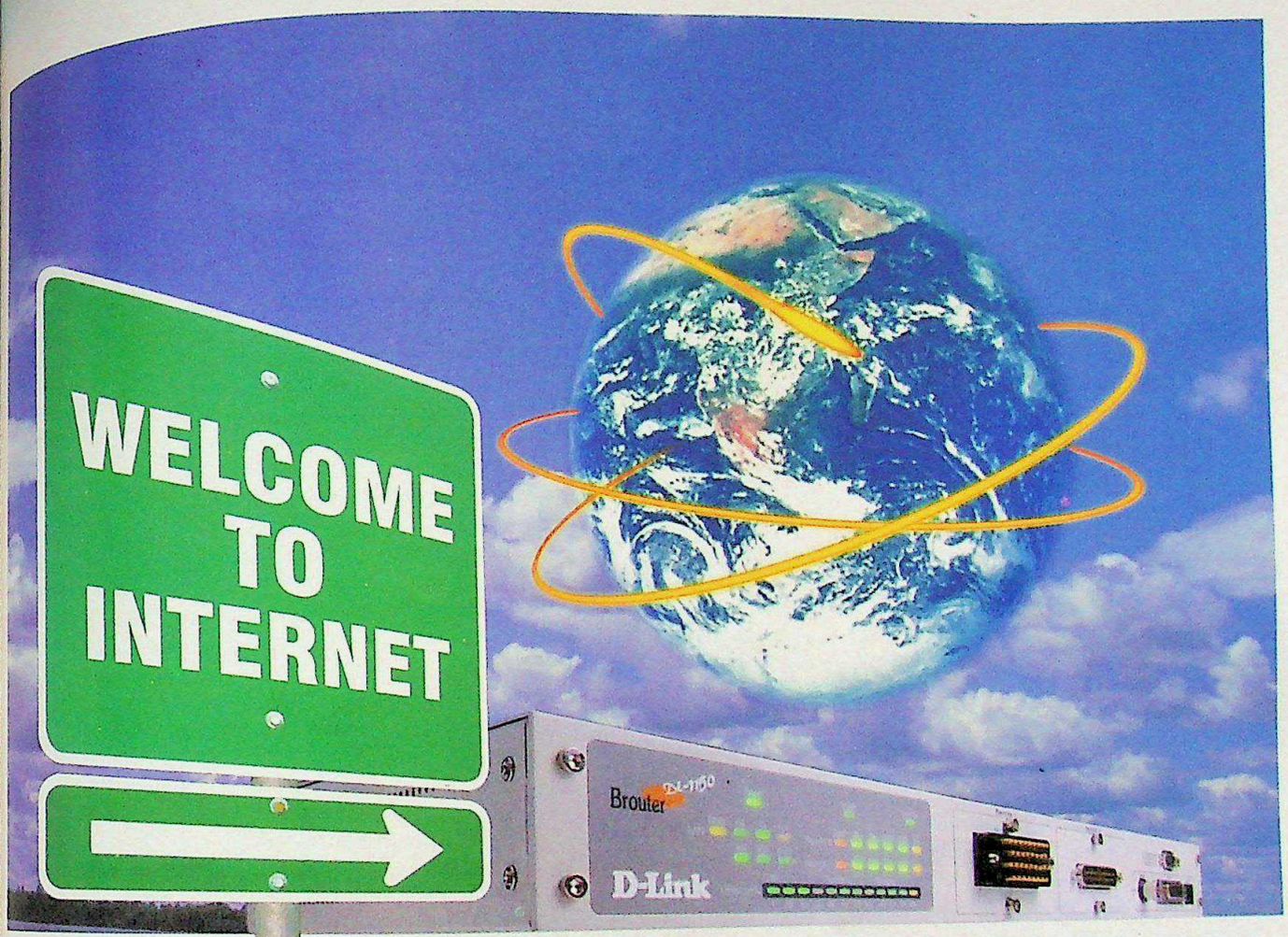
There are two dozen or so adapters on the market, but we especially liked Cogent's EM110 TX, Intel's EtherExpress PRO/100 PCI, 3Com's Fast EtherLink 10/100 PCI, and the ZNYX NetBlaster ZX342. Each adapter comes with a wide array of NOS support, including Artisoft

PRODUCT REVIEWS

Product reviews in
PC Magazine India
enable decision-makers
in the corporate sector
ranging from CEOs to EDP executives
to select the products
that meet their specific requirements.

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HOW WE TESTED

100Base-T4 NIC

We tested three PCI 100Base-T4 adapters hot off the assembly line. They performed about the same as the 100Base-TX adapters we tested last year, and CPU utilization was a differentiating factor. In this early look, Cogent's adapter was the leader.

What the Numbers Mean

Throughput and CPU utilization are the two major gauges of performance for a network adapter. Higher throughput means data is transmitted faster between client PCs and the network; lower CPU utilization means the adapter does not steal too much of the CPU's processing time from other apps.

On our test transferring 64-byte packets, all three adapters performed similarly, although 3Com's throughput and CPU utilization scores trailed Cogent's and Racore's slightly. The numbers began to skew at 1K, with Cogent and Racore performing similarly and 3Com lagging behind.

When we pushed the server adapters toward their performance limits at 32K, Cogent, with steady high throughput and low CPU utilization, outran Racore and 3Com. The Cogent adapter's results were similar to those for the Intel EtherExpress PRO/100B 100BASE-TX adapter, which earned our Editors' Choice in last year's testing.

The hardware chip set and software drivers play a crucial role in determining a network adapter's performance. The 3Com Fast EtherLink was equipped with a proprietary 3Com Parallel Tasking 40-0282 chip set; the Cogent eMaster+ EM110 used a Digital 21140-AB chip; and the Racore M8149-040 came with a Texas Instruments ThunderLAN TMETE 100.

Although the chip set determines the basic performance of an adapter, an optimized software driver that takes full advantage of the chip set can improve final performance. This is why two network adapters from different companies with the same chip set sometimes perform differently.

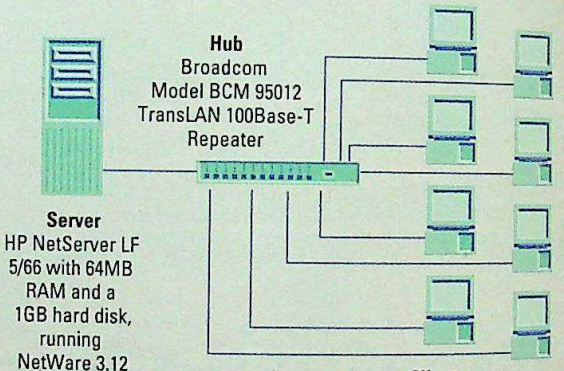
It's a good idea to download and use the most up-to-date drivers from your adapter company's BBS bulletin service or Web site. A newer version driver generally is more bug-free and optimized for performance.

All three adapters in this group support 10/100 dual-speed auto-sensing and bus mastering. Bus mastering lets the adapter access the computer's memory and resources independently of the CPU, thereby decreasing CPU utilization.
—Analysis written by Alex Ho

How We Tested

We set out to evaluate three new 100Base-T4 Fast Ethernet PCI adapters. We tested the adapters using our Ziff-Davis Benchmark Operation's NetBench 4.01.

We connected the server and clients over Category 4 UTP cables via two eight-port Broadcom TransLAN 100Base-T stackable Ethernet hubs. According to a Fluke DSP-100 LAN cable tester, our Category 4 cables had an average of 66.7 dB crossover isolation when running at a 12.5 MHz frequency, and 0.3 dB attenuation at 12.5 MHz.



TEST-BED DIAGRAM: *100Base-T.*

To create our **NIC Performance/Efficiency Index** we tracked the server's CPU utilization by running Novell's STAT.NLM during our test. Each adapter's index score then was calculated by dividing the server adapter's throughput by the recorded CPU utilization.

We tested each adapter using packet sizes of 64 bytes, 1K, and 32K (the same test sizes we used in last year's look at 100Base-TX adapters). Though a typical packet size is around 4K, we revved up our tests to 32K in order to observe the strengths and weaknesses of these products under pressure. A product that does well at 32K probably has a more efficient adapter processor all the way around.

▲ Higher scores represent better performance. ▼ Lower scores represent better performance.	64-byte blocks		1K blocks		32K blocks		
	NIC Throughput Mbps ▲	CPU Utilization Percent ▼	NIC Throughput Mbps ▲	CPU Utilization Percent ▼	NIC Throughput Mbps ▲	CPU Utilization Percent ▼	NIC Performance Efficiency Index* ▲
Cogent eMaster	8.17	93	74.8	51	81.0	24	3.4
Racore M8149-040	8.27	96	70.3	54	67.0	40	1.7
3Com Fast EtherLink	6.89	97	65.1	86	84.1	66	1.3

* NIC Performance Efficiency Index numbers are calculated by dividing the server adapters' 32K NIC Throughput scores by the 32K CPU Utilization scores.

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LANtastic, Novell NetWare 3.*x* and 4.*x*, SunOS, and Windows for Workgroups, Windows 95, and Windows NT.

With their double speed capability and competitive pricing, Fast Ethernet adapters are a no-brainer purchase for your network. The trick is to buy the right adapter. Look for one that provides a single port for automatic switching and make sure that it doesn't rely too heavily on the CPU. When it comes time to switch to Fast Ethernet, having this groundwork in place will make the transition easier.

10-Mbps Switched Hubs

Switched Ethernet is one of the cheapest and easiest ways to extend the life of your 10-Mbps Ethernet LAN without overhauling your network. With prices ranging from $200 to $250 per managed port, switched Ethernet hubs are an excellent solution for departmental or workgroup LANs that communicate with a small group of servers. It's as easy as replacing the Ethernet hubs in the wire closet with a switching hub.

These switches do not necessarily have to replace a hub port-for-port. And switches can be used for segmenting workgroup hubs from the rest of the network or for setting up a dedicated 10-Mbps pipe to a server that caters to a select group of clients. Switching also provides bidirectional capabilities, allowing clients to transmit and receive data at the same time, for a total throughput of 20 Mbps.

You have a lot of choice among the large number of vendors in this market, both in pricing and feature sets. You can choose among a range of port densities, high-speed port options, management capabilities, and virtual LAN (VLAN) capabilities.

Fast Ethernet ports can be used for switch-to-switch or backbone installations and should be able to operate in full-duplex mode. Full-duplex enables the Fast Ethernet pipes to provide for effectual throughput of 200 Mbps between the switch and the server or between two switches. If you dabble in VLANs, you can logically break out the ports on the hub into several separate LANs via the management software. This is particularly useful for segmenting networks and controlling broadcast traffic. Among the many vendors with switches on the market are Bay Networks, Cabletron, Cisco, and 3Com.

Bay Networks' BayStack Ethernet Workgroup Switch offers 6 switched 10-Mbps ports. Unlike many other switches, though, it has only one optional uplink connection available for connectivity to higher bandwidth technologies such as Fast Ethernet. Like the 3Com switch, this BayStack switch has centralized management—under Bay's Optivity.

Cabletron's FN10 Ethernet switch is available in 12- or 24-port models. The FN10 has two optional Fast Ethernet ports ($3,185 for two TX ports; $3,895 for two FX ports).

The $6,295 Catalyst 2100 from Cisco provides 25 10Base-T ports and two Fast Ethernet ports. In addition to port switching, the Catalyst 2100 also supports up to four VLANs. It offers workgroups connectivity to Fast Ethernet over UTP or fiber cabling. This switch can be controlled from a central management station with Cisco Works, a series of SNMP management applications.

3Com's SuperStack LinkSwitch 1000 hub is a switch solution with 12 or 24 Ethernet ports ($3,975 and $4,975, respectively) and up to two 100Base-T ports, which can be UTP or fiber optic cable. The LinkSwitch 1000 carries all the benefits associated with being a part of 3Com's SuperStack solution. This includes a redundant power supply and Transcend, 3Com's SNMP management software. If you're looking for VLAN support, however, you may want to look at the Catalyst 2100 from Cisco Systems.

Each of these vendors and many others offer a full range of Ethernet switching hubs and other hubs that interoperate to create network solutions for small workgroups and larger corporations.

100Base-T Hubs

If you're in design or redesign mode and intending to build higher bandwidth into your network, one possible solution is to use shared 100Base-T hubs. Shared hubs certainly provide high-performance networking between desktops and servers in a workgroup environment. They create a shared environment at ten times the bandwidth of 10 Mbps.

But beware that the 100-Mbps bandwidth carries a few limitations. The maximum run supported for 100Base-T is (theoretically) 250 meters—one-tenth that of 10-Mbps Ethernet. Moreover, Fast Ethernet switches can be cascaded only once between network hubs. Standard Ethernet hubs can be cascaded three to five times. You can overcome these limits by deploying stackable hubs and switches, and thereby install Fast Ethernet on a large scale.

Some of the distinct features of 100Base-T hubs are port density, management capabilities, and pricing. Scalability is probably the most important factor when selecting a hub. Management capabilities are necessary for tracking network traffic and problems when they arise. Here are just a sampling of the Fast Ethernet products from which you can choose.

For small workgroups, with fewer than 30 clients, Cisco Systems offers its family of nonstackable FastHub 100Base-TX hubs, which are available with 4, 8, and 16 unmanaged ports ($995, $1,595, and $3,195 respectively) Other members of the FastHub 100 family include the 12-port 100Base-FX and 15-port 100Base-TX, which has one FX port to connect switches over fiber. Cisco has no management package, but MIBs are available to any SNMP-compliant package.

3Com's SuperStack LinkBuilder FMS 100 hub offers 12 100Base-TX ports and an optional media-flexible port for $2,899. The LinkBuilder FMS 100 reaps many benefits as a part of 3Com's SuperStack line of stackable hubs: a redundant power supply, an optional management unit that offers full SNMP capabilities, and Transcend management application support. 3Com will be shipping the LinkBuilder FMS 100 T4 hub, with 12 ports ($2,388), later this year.

Intel's stackable Express Stackable 100Base-TX hub ($2,395) has 12 ports with an optional management module ($2,295), which provides SNMP support for the entire six-unit stack.

A more flexible solution is the Bay Stack 100Base-TX hub from Bay Networks. The two-slot chassis BayStack 100Base-TX hub is available with either 12 or 24 ports, ($2,375 and $4,370). And with a maximum of six hubs in a stack, the Bay Stack 100Base-TX lets you create a network of 144 unmanaged ports or 132 managed ports. The optional management module requires two slots in one of the stack's hubs. Then, you can manage the entire stack using Bay Networks' Optivity management applications.

The Cabletron HubStack series consists of multiple hub solutions, including the SEHI100TX-22 ($7,995) and the SEH100TX-22 ($6,995). The 12-port hub is available as an intelligent or a nonintelligent component of the HubStack solution. As many as five nonintelligent hubs, or one intelligent hub and four nonintelligent hubs, can be stacked into a single unit, providing 60 ports. Network management is handled by Cabletron's Spectrum Element Management.

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Ethernet Switching: What's Not to Like?

By Charles Lin

Not ready to commit to 100-Mbps Ethernet in any form but still need more bandwidth? You should give Ethernet switching a second look. This inexpensive upgrade can be all you need to sustain your network for years to come. Of the high-speed alternatives, only switched Ethernet lets you both keep your Ethernet infrastructure and introduce more bandwidth with almost no downtime.

Ethernet switching is the dynamic routing of packets without regard to protocols, which results in higher bandwidth. It's usually understood to offer a full 10-Mbps pipe either to each lucky, attached client or server, or to a hub with several clients. But you should assess your own needs first. If your network begins sustaining twice its average utilization, or if your average utilization runs at more than 50 percent of bandwidth, you're a good candidate for Ethernet switching. If your average utilization is low but reaches saturation when it's busy, you may need to go straight to 100-Mbps Fast Ethernet or 100VG-AnyLAN.

> Only 10-Mbps switches let you add bandwidth *and* keep your infrastructure with almost no downtime.

LAN SWITCHING VERSUS WORKGROUP SWITCHING

You can position the switch in one of two key places. You might put it on the network backbone, with hubs attached to each port. Used this way, the switch mainly divides the network into smaller collision domains, which keeps a busy segment from affecting other segments. The switch should accommodate a large number of MAC addresses for all those users. It also should have a high-speed port.

Sometimes called a department switch, the switch comes either as a chassis-based module or as a stackable unit. Chassis-based switches cost more, but they usually support more switch modules for a highly scalable system with redundant power supplies and central management. Stackables are more affordable and can grow as a business grows.

Workgroup switches support fewer MAC addresses but also are less expensive. They are ideal where, for example, you have a small group of users to segregate from the rest of the network because of their high network usage.

SWITCHING ARCHITECTURES

The two basic approaches to switching Ethernet packets are store-and-forward and cut-through. You can choose between the two based on a couple of issues, but don't do it on perceived performance differences. All of *PC Magazine*'s previous switch testing has revealed that latency differences between the two results in no significant differences in performance. The only limitation seems to be Ethernet's maximum line speed.

That said, store-and-forward carries the most latency. The entire packet is checked before it is passed to its destination port. Most store-and-forward switches comply with the Spanning Tree algorithm. This algorithm discovers the best path to each destination and stores it in the look-up table. Much like a bridge, the incoming frame is re-sent to the port specified in the look-up table. Store-and-forward also enables administrators to create a redundant physical network for security.

Cut-though starts forwarding the packet when the address is read. Although cut-through introduces little latency, retransmission of a packet is sometimes necessary after it reaches its destination, costing valuable network bandwidth. Protocols that support packet burst will not benefit greatly from cut-through, because packets still are stored until a destination port buffer clears. Some vendors implement variations on these two themes, but the average user will not notice the difference in performance.

HIGH-SPEED OPTIONS

You'll want to secure a switch with a high-speed port, which can connect your switch to the network backbone or be used as a dedicated line to the server. Many products offer 100-Mbps uplink or plug-in modules for FDDI and ATM. A 100-Mbps full-duplex port can make desktop video a reality without revamping the entire Ethernet infrastructure.

VIRTUAL LANS

More and more switch vendors are building virtual LAN capabilities into their products. Virtual LANs (VLANs) enable administrators to create logical workgroups of users via software to segment groups with high traffic from one another. It does help you manage your bandwidth and even pays security dividends, but virtual LANs are complex to manage.

A perfect VLAN will allow administrators to group users notwithstanding physical locations. Any group member can receive broadcast and security restrictions no matter how the data is routed. Not yet a mature technology, VLANs are nevertheless an area of network computing to watch.

CALL THE MANAGER

Managing Ethernet switches is not as easy as it may seem. If the packet doesn't find its destination, switches will make it more difficult to locate the problem. Network analyzers will not provide an accurate view in a switched port, because it is not a shared collision plane.

Every switching product offers out-of-band management, which may be fine for small workgroups. But if you can afford SNMP management, go for it. Most switches support SNMP agents with MIB II–compliant interfaces, so you can manage all of your devices from a central SNMP console using such software as HP's OpenView. MIB-II is used to gather statistics on the system and protocol. Most devices also offer in-band management via a proprietary Windows or DOS application.

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100-Mbps Switches

Can you never get enough bandwidth? Does it seem to take forever to transfer those memory-hogging multimedia files? One solution could be switched Fast Ethernet, which offers the best of both worlds if you can get over the sticker shock. Fast Ethernet hubs combine switching technology with the speed of Fast Ethernet to provide a dedicated 100-Mbps connection for a group of servers, workgroups, or high-powered clients.

Similar to a telephone system, switching hubs make a virtual connection between two ports and release the connection after the communication is completed. Switches are useful in extending the diameter of the Fast Ethernet LAN beyond the 250-meter limit and are a must when implementing large-scale Fast Ethernet installations. Because of its high price tag ($800 to $1000 per port), however, switched 100Base-T is primarily for backbone solutions or server farms that require large bandwidth.

Although 100-Mbps switched Ethernet is similar to 10-Mbps switched Ethernet in occupation, the 100-Mbps switch requires the Category 5 specifications necessary for Fast Ethernet. The Fast Ethernet switch requires more sophisticated and costly internal components to transfer data at a faster rate, which accounts for its higher price tag..

Features to look for in a switching hub are port density, management, full-duplex and VLAN (Virtual LAN) support. Fast Ethernet ports are used for switch-to-hub or -backbone installations, and full-duplex capabilities will allow the Fast Ethernet to transmit data at 200 Mbps between the switch and the server or between switches. In conjunction with your management software, VLAN can divide the ports on the hub into several separate LANs. This is particularly useful for segmenting networks and controlling broadcast traffic.

Intel's Express Switching hub ($4,995) offers five100Base-TX switched ports plus two additional option ports that accommodate 100Base-TX ($1195) or 100Base-FX ($1495) expansion modules. A Microsoft Windows–based package is coming.

The Cabletron FN-100 series of switches are available in two models. The FN-100-8TX is an 8-port hub ($16,800 list) and the FN-100-16TX is a 16-port hub ($24,115 list). Each port is capable of operating at either 10 Mbps or 100 Mbps, making for easy upgrades. Cabletron's Spectrum management applications allow you to manage the hubs from a centrally located station.

Similar to the FN-100, the Bay Networks' 28115 LattisSwitch 16-UTP port switching hub ($16,500) supports both 10 Mbps and 100 Mbps at each port. Two optional high-speed transceivers with 100Base-TX ($795) and 100Base-FX ($995) are available. Seven LattisSwitches can be linked together for a total of 112 managed ports and 32 VLANs per switch. This equals 64 VLANs for the entire stack. LattisSwitch uses Bay's Optivity network management application.

The Cisco Catalyst 2900 series offers 12 10/100 switched Fast Ethernet TX or FX ports starting at $15,000. Two additional ports are used for linking to other switches. CiscoView, Cisco's management package, is used to configure and manage the Catalyst 2900. Additionally, the Catalyst 2900 comes with RMON support built in. □

MULTIPLE ACCESS By Robert P. Lipschutz

Hop on the New Network



Web this, Web that. Every company we talk with says it has an Internet or intranet product, even if it doesn't. It's a whole new networking world out there. NetWare and its IPX/SPX protocol must share networking bandwidth with Windows NT, Web products, and TCP/IP. Besides this onslaught, you've got new networking technologies to think about. Here's a quick take on some products that can help you in your migration to TCP/IP intranets running over switched Ethernet and Fast Ethernet.

First, the right operating systems can make the change go more easily. Windows 95, OS/2 Warp Connect, and Windows NT each can load multiple networking clients, and each has a TCP/IP stack built in. In addition, each has a broad range of drivers for the fast networking adapters. On your server, Windows NT and all the Unix platforms make "going TCP/IP" easier by providing the protocol stack and applications such as FTP server, HTTP server, DNS, NNTP, SMTP, and telnet. Novell's NetWare IP will boost its TCP/IP connectivity as well. But you should think about trying SunSoft's Solaris or SGI's IRIX for some of these TCP/IP applications.

On to your clients. Get around the problem of a TCP/IP address at every desktop. Use the Dynamic Host Control Protocol (DHCP) for allocating a central pool of addresses to desktops. Or use an IPX/IP gateway—such as Bay Networks' Instant Internet, Cisco's Internet Junction, or Firefox's Nov*ix for NetWare—and don't touch your clients.

Next, grab some new analysis tools that work with the new networks. All the latest protocol analyzers have Fast Ethernet options, including Wandel & Goltermann's new DA-31, Novell's LANalyzer, and Network General's Sniffer. To manage switched networks, you'll need RMON on your switch. Take a look at Cisco's Catalyst, Fore Systems' ES-38XX, and Madge's SMON.

> Take some of your programming talent, and turn it loose on the new brand of client/server computing using Web browsers, servers, and database backends.

Buy for the future when you can. Buy Fast Ethernet 10/100 adapters even if you only plan to use the 10-Mbps option for a while. Cogent, Intel, SMC, and 3Com have done very well on our tests. Buy Ethernet switches with high-speed connection options. Buy Web servers, and use them in your own department. Take some of your programming talent, and turn it loose on the new brand of client/server computing using Web browsers, servers, and database backends.

Whatever you do, don't try to limit the creativity of the intranet revolution. Don't try to control your users' communications channels. Just take care of the important data. Let each person load a local Web page, and use an individual e-mail package. You make the decisions on the database connectivity and critical data. Just resolve to find new ways to leverage the TCP/IP applications that have worked so well for the Internet. Don't fight it—you can have all the bandwidth you need.

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HANDS-ON REVIEWS OF NEW NETWORKING PRODUCTS

WIDE-AREA CONNECTIONS

Hughes Networks on The Final Frontier

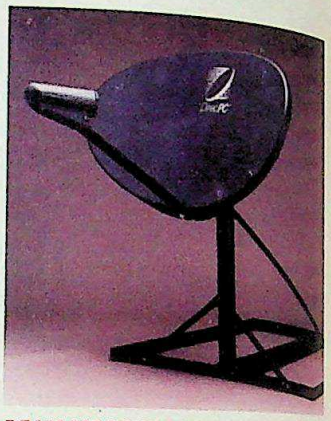
By Jeffrey G. Witt

For personal computer users, space is no longer the final frontier. High-speed digital data is now within your orbit by way of the Hughes DirecPC satellite information service, not to be confused with the home entertainment service provided by a sister company of Hughes. Hughes Network has combined satellite and computing technologies to offer Internet connectivity, data transmissions, and real-time audio and video broadcasts.

This system offers high-speed data communications beyond 28.8-Kbps modem speed, and it isn't constrained by geographical location. Unlike ISDN, the DirecPC service is available now in all 48 contiguous states. This claim can't be made by such competitors as cable modems and ADSL, both of which hold promise but are still in the definition and testing phase.

End users and corporations alike will be attracted by the anywhere, anytime capabilities of DirecPC service, but the actual deployment may be quite different for the two groups. Small offices and individuals who don't have communication infrastructures available or in place will look first to DirecPC's Internet application, while the interest of larger organizations will lie in the product's software distribution mechanism or multimedia content. Cost effectiveness can only be measured by comparing the price of DirecPC service with that of similar services in your area or of the service you are using now.

As stated, corporate attention will fall primarily on the distribution of real-time data and multimedia application potential offered by the product. The real-time stock and sports tickers, as well as the CNN Headline News broadcast in Indeo format, give a taste of the versatility and possibilities for corporate content and presentation.



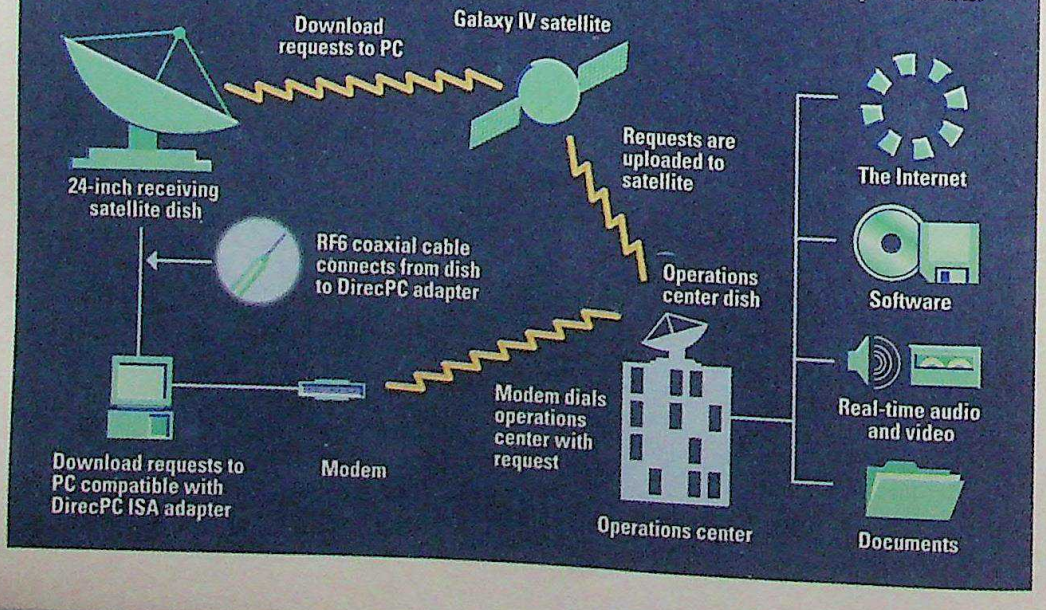
BEAM ME DOWN: *DirecPC provides*

These real-time applications, while fun to have on the desktop, give only a sense of the possible. Like all new technologies, the first generation always tends to be a little rough around the edges. We were able to use them under both Windows 3.11 and Windows 95, but their memory requirements didn't allow simultaneous use on our 16MB machine. The interfaces for the stock and sports tickers are sparse, and the CNN broadcast quality will remind you of an ISDN videoconference.

Hughes, however, doesn't intend to be the sole application or content provider. IBM already has enlisted the technology to distribute its software to dispersed sites and potential retail locations. Optional licensing packages are available for posting third-party content, including service for high-quality MPEG-1 formats that can be used for distance learning or for broadcasting corporate training videos. Any regularly transmitted information in any one of a variety of formats is a candidate for the DirecPC, with potential cost savings based on fixed volume rates for posting content. In addition, Hughes

Dishing Up Downloads

The DirecPC offers a 12-Mbps pipe to your PC, allowing Internet downloads of 400 Kbps—up to 3 Mbps for data files—and the capacity for multimedia services. Initial calls for service are made by the modem and then uplinked by the DirecPC Network Operations Center to the Galaxy IV satellite.



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DirecPC Access Kit

has a DES encryption scheme that provides security for any transmitted data.

As for individual users, the Web surfing that DirecPC offers will draw interest initially because of the ever-growing popularity of the Internet. This is DirecPC's most compelling application. Touring Web sites is quick with DirecPC's included Turbo Internet software and any browser.

Using Netscape Navigator, we moved from link to link quickly, because modem requests are small and graphically intense Web pages are downloaded at a fast clip. In anecdotal testing, we found ISDN cruising somewhat quicker. But when it came down to actually downloading large files from the Web, ISDN could not compare with DirecPC's ability to handle large documents, video, and audio clips. (Hughes claims you can download a 400-page document in one minute.)

Users can use their own Internet Service Provider (ISP), as long as the ISP provides a SLIP/PPP connection. Hughes can act as your ISP, but the cost is relatively high—$2.95 per minute as compared with the average $2.95 per hour that most ISPs charge. The basic package's monthly fee covers up to 30MB of downloaded data per month. Additional services are provided on a pay-as-you-go basis.

Larger companies will find the DirecPC's Internet access capabilities less compelling because of its lack of robust networking options. The cable from the satellite dish can be split and additional adapters purchased, but the additional cost and configuration may prove prohibitive. Hughes has plans to deliver products to leverage current network installations in the future.

As for performance, the DirecPC offers a 12-Mbps pipe to your PC, allowing Internet downloads of 400 Kbps—up to 3 Mbps for data files—and the capacity for multimedia services. DirecPC's high performance is a one-way street, however, because initial calls for service are made by a traditional analog modem. The requests sent by the modem are uplinked by the DirecPC Network Operations Center (NOC) to the Galaxy IV, a geostationary satellite orbiting 22,000 miles above the surface of the Earth.

The DirecPC Access Kit (DAK), Model 40 costs $695 and consists of an ISA adapter card, software, and a 24-inch elliptical dish with mounting hardware. Bundled with the DAK are a number of services maintained for a $15.95 monthly fee. These include the Turbo Internet software, Starlight Network's CNN Headline News, DATA Broadcasting's financial ticker, and SportsTicker, as well as access to Package Explorer, an electronic catalog of free and for-sale services.

Installation can be done by the sophisticated user, or by Hughes for an additional fee of $450. To access the system, you'll need a DOS/Windows PC with at least a 486/66 processor, 8 MB of RAM, 500 MB of disk space, and a modem with an analog phone line.

DirecPC Access Kit, Model 40. List price: $695. Hughes Network Systems, Germantown, MD; http://www .hns.com.

(Indian subsidiary Hughes Software India, International Trade Tower, 2nd Floor, Nehru Place, New Delhi 110 019. Tel : 6470833)

INTRANET SOFTWARE

More Notes for the Web

By Tony Pompili

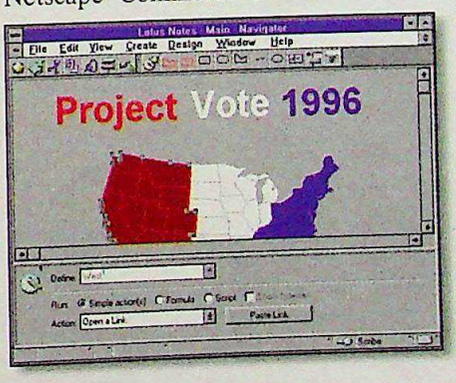
The most recent effort by Lotus Development Corp. to make Notes, its popular groupware and communications software, the application development platform of choice for the Internet has taken the form of InterNotes Web Publisher 4.0. Though not a revolutionary upgrade, this version's linked graphics and its ability to run on AIX, OS/2, Sun Solaris, Windows 95, and Windows NT give Notes sites an incremental upgrade to the previous version and extend the product to sites running on niche platforms.

Notes sites looking to improve the appearance of their Web Publisher sites will appreciate this latest version. It is, however, more useful as an add-on for companies already invested in Notes rather than as an inducement to purchase Notes and use it as a Web application development tool.

Web Publisher also has a couple of drawbacks. Like the previous version, it generates HTML pages but doesn't broadcast them. This means you still need a Web server. But Web Publisher will operate with any Web server that works with Common Gateway Interface (CGI) programs.

Another shortcoming is that Web Publisher, the Notes server, and the Web server all have to reside on a single machine. Because the Notes server is demanding in terms of RAM, processing clock cycles, and hard disk utilization, you'll probably want a beefy box, especially if you're planning to connect users.

We tested Web Publisher on Windows NT Server 3.51 with Service Pack 4 using Windows 95 clients. And we used Netscape's Navigator 2.0 and Netscape Commerce server.



YOU HAVE A CHOICE: *InterNotes is available*

The primary function of Web Publisher 4.0 is to convert Notes databases, views, and documents into HTML pages. Web Publisher performs two server tasks that create a bi-directional gateway between Notes and Web servers. It checks a list of to-be-published Notes databases at user-defined intervals, automatically converts any new views or documents into HTML pages, and places them on the Web server. It then converts text and Notes DocLinks to HTML rich text and links the them automatically. You can also design applications that use HTML forms to collect information from Web browser users and add the results to a Notes database.

But one of Web Publisher's best attributes is that it is bundled free with any single or multiprocessor Notes Release 4.*x* server. Notes 4.1, which wasn't available at press time, will ship with Web Publisher right on the CD. Owners of previous versions of Notes can download Publisher 4.0 from Lotus's Web site.

The price tag is fitting because this newest version is lean on added functionality and documentation is neither stellar nor available in a hard copy. The product does, however, bring some of the bells and whistles of Notes 4.0 to the Internet and the intranet side of the browser. Greater symbiosis with Notes Navigators allows Web Publisher to extend a tiny bit of the graphical Navigators of Notes 4.0 into the world of the Web.

Introduced in Notes 4.0, Navigators let you build database and application interfaces with buttons and linked graphics and icons, making it easier to move about a Notes data-

Continues on page 42

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NETWORK OPERATING SYSTEMS

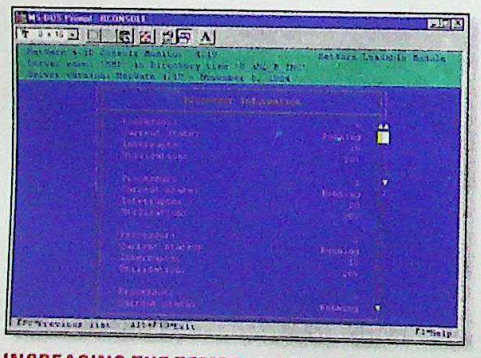
Novell SMP: A Step Slow?

By Steve Buehler

In our recent *PC Magazine* roundup of network operating systems (NOSs), we covered many aspects of NOSs. One aspect that we didn't focus on, however, was symmetric multiprocessing (SMP). Now we can. We have Novell's NetWare 4.1 SMP in house, and at first look Novell seems to have taken only a small step forward in technology.

But Novell is aggressively rolling out NetWare 4.1 SMP. This NOS requires certification of hardware compatibility that is available only through hardware manufacturers, of which there's a long list. Industry giants ALR, Compaq, HP, NetFrame, Tricord, and many others have NetWare 4.1 SMP available today. Potential buyers should look carefully, though, because NetWare 4.1 SMP will earn its keep only in selected applications.

Since NetWare was originally developed for file and print, we didn't expect to see huge performance gains in that area from SMP-enabled NetWare. *PC Week* reported on an in-depth performance test of Novell SMP in their April 1, 1996, issue, and the results confirmed what we expected to see. Our Labs testing showed that if you use your Novell NetWare server for file and print, additional CPUs and the SMP NLMs will not gain anything for you.



INCREASING THE TEMPO: *NetWare 4.1 SMP increases application server throughput.*

The additional processors slow down your total throughput, especially when you have fewer than 20 clients attached to the network. NetBench benchmark tests indicated that a single processor NetWare peaked at about 30 Mbps with 16 clients; the SMP-enabled version topped out at about 22 Mbps with 20 clients.

In application server testing, NetWare showed a nonlinear increase in throughput as CPUs were added. Four processors provided 2.8 times the throughput of a single processor.

Successfully integrating SMP into a network environment will take some work. Increased throughput tends to highlight other bottlenecks in the server. NetWare's SMOP capabilities can outrun most server disk hardware use today.

NetWare 4.1 SMP. List price: Varies according to vendor. Novell Inc., Provo, UT; http://netware.novell.com. *(Indian subsidiary Novell SW Development India, Bangalore; Indian partner Onward Novell, Bombay.)*

CROSSTALK



Frank Derfler

"Finally! Novell's entry into the SMP market is out. Although our testing shows that extra CPUs don't make much difference in NetWare's traditional file and print territory, you've got to be able to run on multiprocessor systems in this exploding era of applications servers. There, the SMP version of NetWare does affect performance and could help Novell hold onto some of its installed base."



Gail Shaffer

"Yes, Frank, but you need a separate package, and retrofitting an older NOS may not yield as sleek a product as Windows NT, engineered from the start to handle SMP. Early adopters of SMP had only Windows NT. Administrators may be looking more for the best integration between Windows NT app servers and NetWare networks than anything else."

InterNotes

Continued from page 41

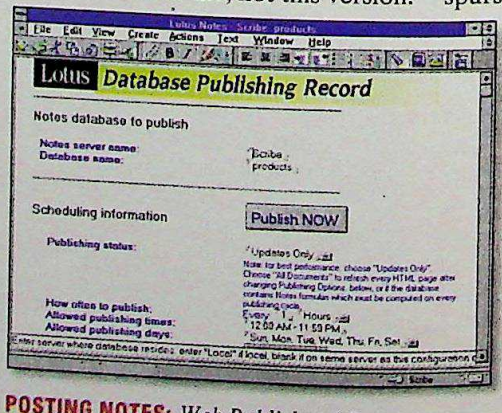
base. For example, you can create a graphic that, when clicked on, opens a view. And Web Publisher lets you convert some Navigator elements to Web Publisher pages.

You can convert a Graphic Background, which is basically wallpaper that is segmented into hotspots. Each hotspot can have its own link to a document or view. Some of the other graphical elements, such as buttons and graphical buttons, are not yet supported under Web Publisher.

Notes includes some commands such as URLOpen that allow you to dovetail Notes database development with Web Publisher applications. Other commands—creating full-text search fields, for instance—use the Description field, which was formerly reserved in Notes applications for help. This is still a bit of a kludge because it means that you will probably have to make separate forms and views for Notes users and Web browser users.

Just as in Version 2.1, you can customize which databases are published and how often with Web Publisher Configuration database, another Notes Release 4 database. You can also specify where your home page is and define basic HTML tags and table preferences to customize your HTML pages.

Because the product is now distributed on the Internet, no hard copy documentation is available. Instead Lotus supplies a Notes database and a Toolkit that has some useful application hints. Strangely enough, the Toolkit applies only to Web Publisher 2.1, not this version.



POSTING NOTES: *Web Publisher 4.0 converts Notes databases and views into Web pages.*

Other documentation holes include a lack of sample databases. The single database supplied doesn't even include an example of Navigator, or image maps as they're called on the Web side of Web Publisher. The Lotus site itself is sparse. And this is one of those products that could really benefit from good starter applications or templates.

InterNotes Web Publisher 4.0. List price: Free with Notes 4.1 or downloadable from the Web. Lotus Development Corp., Cambridge, MA; http://www.lotus.com. *(Indian subsidiary Lotus Development, New Delhi; Indian partners ITC, Calcutta; Microland, Bangalore; Sonata, Bangalore; Price: Rs 153,200.)*

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MICHAEL J. MILLER

Rebuilding Componentware

Remember component software? Those little pieces of code that were supposed to be the building blocks for creating custom applications? Well, as the little girl in *Poltergeist II* says, "They're baaack!" Fortunately, these spirits are meant to be friendlier than the apparitions in the movie. Indeed, the aim behind component software is actually quite personal.

The concept is simple: Take the best parts of today's huge, standalone programs and combine them to create applications tailored to our individual needs. For instance, you might take a good spell-checker and combine it with your favorite presentation program or with your Web browser. It all sounded great when computer scientists—and then companies such as Apple, IBM, and Microsoft—started conjuring up these ghosts several years ago. But in practice, the efforts have resulted in a lot more hype than progress.



RENAISSANCE
Component software has fallen far short of the mark. So why is it coming back now?

True, we now have a reasonable way to embed graphs and charts in word processing and desktop publishing documents and, more recently, a new way to collate documents created in multiple programs. And a bunch of Visual Basic programmers did get a number of objects—originally called VBXs, but now referred to as OCXs or as OLE controls—that can be hooked together. But for those of us who mostly use programs rather than write them, the promise of IBM's System Object Model (SOM), Microsoft's OLE, and Apple and IBM's support for OpenDoc remains just that: a promise. We're still a long way off from mix-and-match software.

Lots of us know how to use OLE code and how to use Windows to take advantage of it, but thus far, it hasn't been designed around a network (though this is supposed to change shortly). IBM has been including SOM in OS/2 for years and, a while back, introduced a distributed version called DSOM. IBM's REXX language makes it easy for a programmer to tie together applications, but there's a big difference between a conceptual framework and a solution accessible to end users. And we're a long way off from the time when the bulk of applications can be scripted easily. Apple has the scripting part down better, but its OpenDoc framework remains more concept than reality as well: The bulk of applications don't take advantage of it, and the operating system update that's really designed around OpenDoc has been delayed. Again.

So far, component software has fallen far short of the mark. Maybe it was too ambitious, maybe it was too difficult to implement or use, or maybe end users really didn't want to mix and match software after all.

So why is it coming back now? The answer to this, like most every computer-related question these days, is the Internet. The big news is using browsers as platforms with Java applets, the tiny programs designed to be run within a browser and often embedded within an HTML page. Suddenly, everyone I talk to claims his application or her operating system is "Java-enabled," even if he or she hasn't the slightest clue what that means.

In some cases, we're discussing programming environments for creating Java code. Nothing new here. In other cases, such as in the new versions of Corel WordPerfect 7 and Ventura Publisher, we're talking about saving pages as Java applets to make use of a variety of fonts and more advanced layout options. But perhaps the most interesting development is what's happening to operating systems.

IBM seems to be in the lead, discussing how Merlin, the next version of OS/2, will let you take a Java applet out of your browser and run it on the desktop as a standalone application. Not to be outdone, Microsoft is now saying Windows will be Java-enabled as well—though exactly what that means remains unclear.

Since Java applets are new, they're coming out of the starting gate with many of the latest innovations. Java applets are designed to be portable, and they work on any enabled browser or operating system. More important, most are engineered to be compact and networked and to work in combination with other applications using tools such as Netscape's JavaScript and Microsoft's Visual Basic.

Of course, Java isn't the only game in town. Microsoft is getting into the act with its own ActiveX components, a new version of OCXs designed for networks. And Apple is bound to find a way to make Java and OpenDoc coexist, as well as work with the company's scripting protocols.

Suddenly, component software is back. And you know what? This time, the pieces just might come together. □

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- Auto disconnect of infected nodes to prevent the virus from spreading
- 25th line broadcast to selective users
- Password security
- Does not degrade file server performance
- User defined scheduled scanning for all/specific volumes
- Console/node-based configurability
- Regular updates for registered users

Microsoft SOLUTION PROVIDER

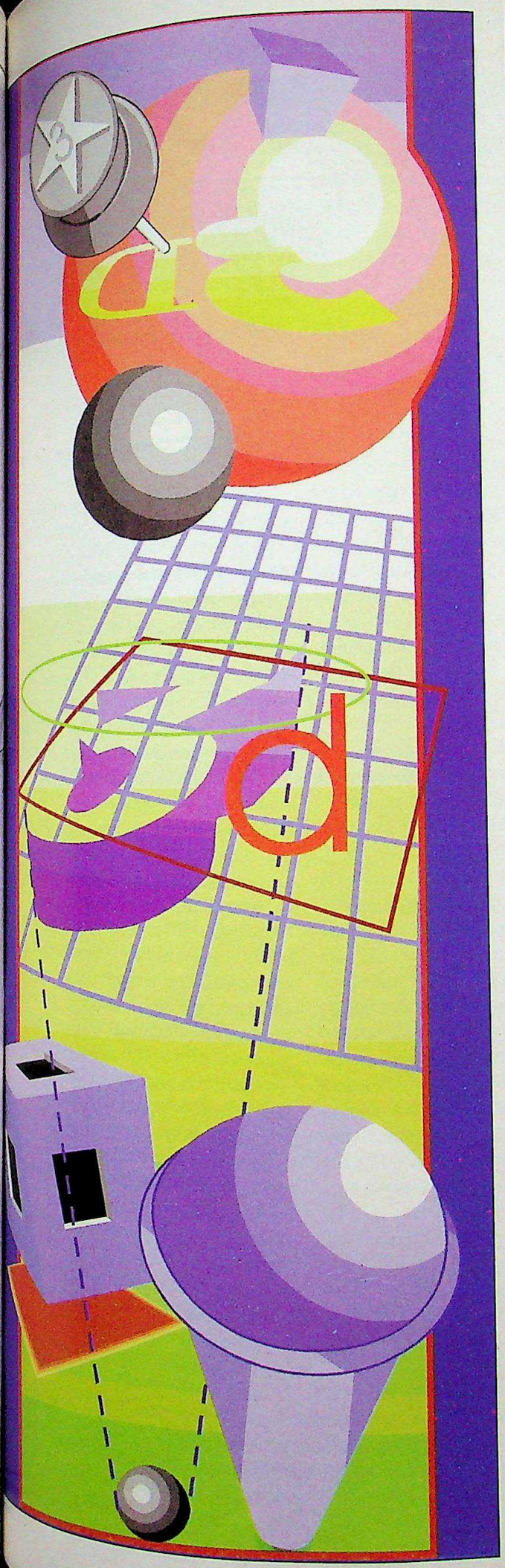
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Feature Story

3-D COMES ALIVE

3-D graphics acceleration is coming to mainstream personal computers, and it's not just for game players.

Like clockwork, each summer and fall the average PC user is confronted by a new technology that upsets the carefully constructed purchasing models from the previous year. This year it's mainstream three-dimensional graphics, a promising technology burdened with a particularly obscure set of jargon and boatloads of market hype. When it delivers what it promises, desktop 3-D will be the dawning of a new age, a technology combining the technological sophistication of a high-end workstation with the enjoyment potential of an arcade game, all from your workaday PC.

For the most part, the 3-D graphics chip revolution has not affected the high-end 3-D boards like those tested in the accompanying roundup. These boards, used by professionals for modeling and CAD, rival workstation performance with dedicated 3-D silicon and sockets for at least 4MB and as much as 24MB of RAM. They also support higher-level pro-

By Jan Ozer

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HIGHLIGHTS

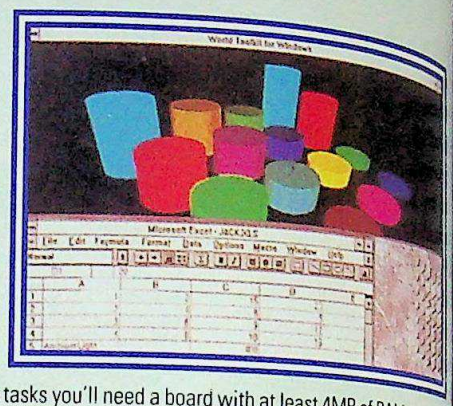
High-End Graphics Boards

3-D is on the verge of becoming a standard for mainstream graphics accelerator boards. With the emergence of Microsoft's Direct3D API and a bevy of new 3-D–capable, low-cost chip sets, developers of games, business software, and VRML Web browser plug-ins are using 3-D graphics with ever-increasing frequency.

With the introduction of Direct3D, Microsoft significantly advanced the ascension of 3-D into the mainstream. This Windows 95 API provides a standard platform through which 3-D software can interact with 3-D hardware, so developers no longer have to write individual drivers for each divergent chip set on the market. This will benefit PC gamers by delivering more realistic environs, as well as business users by allowing applications to deliver information in a more intuitive format.



Graphics professionals care less about the 3-D worlds; they need graphics accelerators that deliver rock-solid images at very high resolutions. The high-end 2-D boards here are aimed at graphic artists, DTP users, and 2-D CAD/CAE designers. For these tasks you'll need a board with at least 4MB of RAM that can deliver high refresh rates (from 80 Hz to 100 Hz or more) at the screen resolutions and color depths you work in.



OpenGL 3D is a whole different game. These ultra-high-end accelerator cards adhere to SGI's OpenGL standard, which ensures accurate rendering of 3-D objects. Unlike in games and traditional business applications, users at this level need exacting accuracy in addition to high frame rates for chores such as 3-D modeling, virtual reality, and 3-D design. Some may recall these boards costing as much as $30,000, but now they can be purchased for much less.

gramming interfaces like SGI's OpenGL and Autodesk's Heidi, which are largely irrelevant to the business user or gamer. We review ten OpenGL-compatible high-end boards in the accompanying story. But such boards sell for $1,000 and up, hardly the type of hardware you will find in a typical business machine. We also review seven 2-D boards representing the higher end of the mainstream—$400 to $600 boards aimed at graphics professionals and power users who want to maximize 2-D GUI performance.

For mainstream PC users, meanwhile, 3-D APIs are coalescing, chips are launching in droves, and application support is booming, perhaps most conspicuously in the games arena but increasingly in business applications as well. The earliest 3-D–capable boards aimed at this market, which were released in time for Christmas last year, generally left users wanting. They found that the 2-D graphics acceleration they were used to for their GUI operating environments was not what they had come to expect from dedicated 2-D boards, and these early adopters also found application support slow in coming.

Those two shortcomings should be rectified by this Christmas. It's a safe bet that 3-D graphics capabilities for games and business applications, along with robust 2-D acceleration, will soon become standard features in mainstream graphics cards that cost less than $200.

The first 3-D accelerators hit the [illegible] market in mid-1995, primarily in the form of products like the Diamond EDGE 3D, which let users play game-console-style games on their computers. While most early 3-D applications were games, business support is steadily growing. 3-D is being integrated into most presentation and authoring programs, while spreadsheets that give you a three-dimensional view of data and even 3-D user interfaces (perhaps Bob 3-D?) are in the works.

We're starting to see virtual 3-D worlds as database front ends, allowing computer novices to view network configurations or remote offices by selecting a city from a spinning globe. Netscape's acquisition of VRML vendor Paper Software and wide spread availability of VRML browser plug-ins forecast 3-D's popularity on the Web as well. While it's safe to assume that 3-D's Web presence will initially be dominated with dreary spinning logos, more advanced Web pages are already enabling "virtual worlds," offering each visitor a unique experience.

WHAT IS 3-D?

3-D chips work with the host CPU to enable computers to generate realistic

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...like graphics much faster than the ...PU could render them alone.

All 3-D images are created in the so... ...ed the 3-D Graphics pipeline, which ...s two stages. First is the *geometry stage*, ...ere the vector graphics information be... ...nd the 3-D image and backgrounds is ...ocessed as triangles readily manipulat... ...d by the computer. The second stage, ...ually handled by a 3-D processor, is *ren...ring* (or *shading*), where the polygon in...rmation is converted to pixels for dis...lay. *Naked triangles* are fairly coarse and ...elifelike, causing developers to seek ...ore advanced functions to enhance ap...earance. These break down into four ...eneral categories: shading, texture map...ing, atmospheric effects, and hidden sur...ace removal, as described in the accom...anying illustration. Each of these effects ...ust be implemented during the geome... ...y phase, then drawn before display.

These techniques—Gouroud shading, ...exture mapping, alpha blending, and so ...t—add significantly to the realism of the ...mage, but also to its complexity. For the ...ost part, a Pentium-class machine can ...anage the geometry side of fairly so...isticated effects without slowing down, ...ut only if a 3-D graphics accelerator as...sts during rendering.

MARKET SEGMENTATION

...What started as an unorganized melange ...f 3-D chip announcements is also falling ...to recognizable categories and markets: ...-D–only chips that require a separate ...-D graphics processor, integrated graph...s chip sets that add 3-D functionality to ...xisting 2-D and video acceleration fea...es, and super-integrated chips that add ...eatures like audio, digital input support, ...d data and fax modem capabilities.

Undeniably, the origins of the PC 3-D ...arket are in arcade games, and a catego... of high-performance, specialty fea...ed products will emerge to serve this ...arket segment. These products, which ...ill ship as standalone 3-D accelerators ...d integrated graphics solutions, will generally be too expensive for the cost-sensitive mainstream marketplace. For example, Diamond's EDGE 3D, based on the nVidia chip set, costs $100 more than Diamond's Stealth 3D 2000, based on S3's ViRGE chip set. However, the nVidia chip set enables wavetable sound, digital joystick input, and supports SEGA game pads, coming close to or even exceeding the arcade experience.

Also competing in this market are NEC/VideoLogic with its PowerVR chip, which will soon appear on sub-$200 3-D accelerators; the Voodoo 3D chip set from 3Dfx; and an unnamed integrated chip set from Cirrus Logic that integrates technology licensed from 3DO.

Some 3-D accelerators, shipping as integrated graphics solutions, will be too expensive for the mainstream marketplace.

Most mainstream graphics card and computer vendors will introduce 3-D into their product lines this summer, probably at a small price premium over 2-D–only systems. These boards will use chips such as S3's ViRGE, Matrox's MGA-1064SG, and ATI Technologies' 3D Rage, which stress price/performance over the complete range of graphics functions. A little higher on the price continuum, Number Nine will weigh in with its Imagine 128 Series 2 chip set, which should adeptly combine 2-D and 3-D functionality. Boards based on the Series 2 may cost around $650. A bevy of veterans and newcomers are also targeting this market, primarily claiming superior performance (3D Labs Permedia, Oak OTI-64311, Rendition Verité) or features like video-out (Trident T3D9695), which lets the graphics card connect to a television. Competing for space on the motherboard is Chromatics Mpact' media engine, which combines 2-D and 3-D graphics, fax/ modem, and audio functionality, along with MPEG-1 compression and decompression and MPEG-2 decompression.

DIRECT 3-D

3-D application support is nascent, primarily because of the lack of a standard application programming interface (API) tying 3-D hardware and software together. Without an API, applications seeking 3-D hardware acceleration for games and other non-OpenGL–level 3-D were forced to write discrete drivers for each supported chip set, a burden for even the largest developer.

This created the now-familiar dynamic wherein hardware developers sought to gain a franchise by convincing software developers to develop programs supporting their proprietary API. As usual, the lack of a stable installed base stifled third-party development, as most software developers declined to support any API without a high-volume bundling agreement to fund the development.

Into this vacuum stepped Microsoft with its March 1996 announcement of the Direct3D API, the last component of the DirectX series of Windows 95 I/O APIs. Architecturally, Direct3D provides high- and low-level APIs for software developers and a hardware abstraction layer that interfaces with drivers written by the 3-D chip vendors. Direct3D is tightly integrated into DirectDraw, enabling combined, bitmapped 3-D and video effects, like playing back video on the faces of a spinning cube.

Functionally, the high-level API includes 3-D functions such as "geometry engines" and object database routines that developers would otherwise have to write or license. The low-level API lets developers of fast-twitch games use their own optimized code and call more specific hardware functions to maximize overall program speed. Direct3D also provides software emulation of 3-D functions, querying the graphics chip set to determine its capabilities and dynamically allocating work between CPU and 3-D chip to maximize overall performance.

Direct3D was immediately embraced by over 80 industry vendors, including vir-

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tually all 3-D chip vendors. The only serious competition comes from Apple's QuickDraw 3D Rave, which provides similar functionality. Microsoft has an early lead in third-party support, and will probably emerge as the API winner.

What about Windows 3.11 and DOS? By now, most business software developers have largely abandoned Windows 3.11 development with 3-D support. Game developers will probably also soon abandon these legacy platforms, since Direct3D provides the hardware access necessary for optimal program speed, and because most 3-D accelerators will likely be sold into Windows 95 systems.

ANALYSIS

All of which is not to say that measuring 3-D chip performance is a simple matter. A quick scan of 3-D chip specs and home pages reveals two emerging benchmarks: pixels per second and triangles per second. Muddying the picture further, most games monitor performance by a third metric, frames per second (fps).

While seemingly objective, all three measures vary greatly depending upon host CPU, screen resolution, color depth, and in the case of triangles per second, enabled features and triangle size. For example, a flat shaded triangle renders much faster than a Gouraud-shaded, perspective-corrected, trilinear MIP-map textured and fogged triangle. These factors combine to make the benchmark test scores cited by the various vendors largely incomparable.

To a significant degree, Direct3D insulates most corporate buyers from the risks associated with buying 3-D hardware: As long as the board supports the new specification, it should work with all new Direct3D applications. For gamers, the short term result is not so clear, as high-volume chip vendors continue to seek ports to their APIs for not only for Windows 3.11 games, but for Windows 95 as well. All of the games developers we contacted intend to support Direct3D once it is shipped and stable. Some will drop all proprietary support, while others intend to continue if it provides a performance advantage.

3-D graphics for the masses is almost here. We're seeing the hardware and compelling software that will make 3-D support in your next graphics card worth the price of admission.

The High & Mighty

Accelerator cards are also getting better and cheaper for graphics and CAD professionals. Here are the best 2-D and 3-D offerings.

By Jeff Mace

Impressive as the coming wave of mainstream Direct3D accelerators may be, those boards will not address the needs of graphics and CAD professionals. So in the following two sections we review the fastest 2-D and 3-D high-end graphics accelerator boards available for the PC.

If you're designing or managing Web pages, editing scanned images or creating your own art, doing in-house desktop publishing, and working in a variety of graphics packages, you need a robust 2-D graphics display adapter. This means at least 4MB of display memory, plus a fast RAMDAC capable of driving your monitor at high refresh rates for flicker-free display at resolutions higher than 800-by-600 at a 24-bit color depth (also called true color). They'll provide significantly more graphics horsepower than the graphics adapters found on many mainstream business PCs.

2-D REVIEW CRITERIA

To be eligible for inclusion in our first review section, a board had to be a production-level shipping product with FCC Class B certification, 4MB of frame b… RAM, stable Windows 95 drivers, and … ability to achieve a vertical screen refr… rate of 75 Hz or better at 1,152-by-864 r… olution. Since these products are aimed … image-editing and other graphics profe… sionals, they also had to include color-c… ibration utilities. Unlike mainstream … graphics cards, which generally cost le… than $200, boards in this realm sell fo… about $500 on the street as of April 1…

Our research turned up seven product… from six leading vendors: ATI Technol… gies, Diamond Multimedia, ELSA, Her… cules, Matrox Graphics, and Numb… Nine Visual Technologies. (STB System… was readying a 4MB version of the Lig… speed 128, though it was not available … time for testing.) Most of these produc… are mature entries that have been arou… for over a year. What is new across th… board, however, is that each of thes… products feature *optimized* Windows … drivers and more complete integrati… into the Windows 95 interface.

With Windows 95's reengineere… graphics subsystem, a particular te… nique for speed optimization has come …

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2-D graphics acceleration

Matrox Millenium

3-D graphics acceleration

Fujitsu Sapphire 3D Designer
Symmetric GLyder 16

Graphics professionals, DTP users, and 2-D CAD designers have several excellent choices from among the seven boards we tested. The best all-around package

is the Matrox Millenium. Sporting 4MB of RAM and Matrox's own MGA chip set, the Millenium delivers ultra-high refesh rates—102 Hz in 1,600-by-1,200 16-bit color mode—for rock-solid displays in your image editing package. It was at or near the top in all of our performance tests, and Matrox has done an excellent job of integrating the card into the Windows 95 environment. Beyond the standard creature comforts (controls for resolution, color depth, virtual window, hardware pan and zoom) the drivers let you select from up to four different configurations via a Quick Access toolbar, so you can quickly toggle among different resolution and color-depth modes with a click of the mouse. The Millenium is affordably priced at $470 on the street, and Matrox reports that price should drop to around $400 by the time you read this.



Three of the other 2-D boards rival the Matrox in performance and functionality, and warrant honorable mentions. Our Editors' Choice from last year has aged well: Number Nine's Imagine 128 remains an excellent choice for handling large bitmaps and vector graphics, showing excellent performance in these areas. The brand new Imagine 128 Series 2 Number Nine is a board to watch. It promises to outperform all others in this group, though the driver set was not fully complete as of our testing. Finally, for those who live and breathe in Windows 95, Hercules has put a good deal of effort into optimizing its Windows 95 implementation of the Terminator Pro. The payoff: easy setup, an excellent feature set, and decent performance.

We saw a fair number of thoroughbreds in the OpenGL 3D arena as well. The best board overall and one of our Editors' Choices is the Symmetric GLyder. It excelled at every 3-D task we asked it to perform, from CAD to modeling to animation, thanks to its Glint architecture with the new 3D Labs Delta coprocessor. Another Editors' Choice goes to the price/performance leader in the category, the Fujitsu Sapphire 3D Designer. It delivers good performance on a range of tasks at all but the highest resolution modes, all at less than $1,000 on the street—a bargain in this category.

Dynamic Pictures' V192 merits an honorable mention. At $4,000 it isn't cheap, but it excels at 3-D CAD tasks that would otherwise require a much more costly workstation. For 2-D CAD as well as 3-D work, the ELSA GLoria ($2,500 street) deserves an honorable mention as a solid jack of all trades.

your attention. This technique bypasses a portion of the GDI (Graphics Device Interface) by patching certain graphics calls and routing them for immediate access by the graphics hardware. While we are awaiting response by Microsoft, which has certain conformance requirements for Windows 95 logo certification, we know from testing that this approach gives a performance edge to vendors who use it (in this review, the Matrox Millenium; see the Benchmark Tests section for details).

In addition to increased performance, the new Windows 95 drivers mean better union with the Windows 95 user interface. Ease-of-use features abound: Many of the boards now offer tight integration into the Display Properties box, right-mouse-click access to features, and the ability to change modes and settings on the fly.

3-D REVIEW CRITERIA

Even more progress has been made in the high-end 3-D graphics arena, where tasks once relegated to $50,000 workstations can now be tackled on a Pentium-class PC equipped with a high-end, 3-D–capable board. Users can now can now work with 3-D design and engineering packages, build fly-throughs of architectural models, invent virtual worlds and 3-D animations, and create visualization and simulation demos to manipulate complex 3-D geometric shapes. To do these, you need a graphics board that can offload many of the complex calculations from the CPU and aid the graphics pipeline. Without it, any movement in 3-D space will appear choppy and unrealistic.

Our research turned up ten products from eight vendors. The AccelGraphics, Diamond Multimedia, ELSA, Fujitsu, Omnicomp, and Symmetric entries are built around the 300SX processor from 3D Labs; Symetric also employs the new 3D Labs Delta coprocessor chip. Dynamic Pictures and Oki (a division of Okidata) have entries based on their own 3-D processors.

The Pentium and Pentium Pro processors, with their ability to quickly process floating point calculations, can now handle a major requirement of 3-D graphics: calculating the geometry at the beginning of the 3-D pipeline. As you move through Z space, or depth, objects in the background appear smaller than those in the foreground. Matrix math is used to compute the transformation associated with the movement of each triangle from one fixed point in space to another. Shading, lighting effects, and varying levels of transparency give the added effect of realism.

This world of high-end OpenGL 3-D is far different from the Direct3D acceleration designed primarily for games and mainstream business use. Direct 3D accelerators will trade off OpenGL-style accuracy for performance. But these OpenGL boards must deliver both: life-like realism (for product renderings and

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medical imaging, for instance) at usable performance speeds. And it comes at a price. While the mainstream Direct3D cards will sell for about $200, these high-end 3-D capabilities run between $1,000 and $4,000.

Whatever your need, be it high resolution and refresh rates in the 2-D realm or workstation-level 3-D, one of the graphics accelerators in the sections that follow will have what it takes.

ATI Technologies Inc.

ATI Graphics Pro Turbo

The ATI Graphics Pro Turbo ($539 list, $435 street) boasts high refresh rates, stable Windows 95 drivers, and nicely integrated Windows 95 utilities. Several other products with similar features outperformed the Graphics Pro Turbo by significant margins, and ATI will soon replace the board with a newer design. But if you can scoop up this card at a bargain price, it might be worth the performance tradeoff.

Installing the card under Windows 95 was simple and straightforward. ATI's Help Wizard guides you through the process, and the Plug and Play–compliant card can correctly set refresh rates using either Windows 95 monitor INF files or DDC-1 or DDC-2b. Boasting a top vertical refresh rate of 100 Hz at a resolution of 1,024 by 768 pixels in 16-bit color, the Graphics Pro Turbo sustains a reasonably flicker-free vertical refresh rate (70 Hz) in 16-bit color at its maximum resolution, 1,280-by-1024.

ATI's Windows 95 utilities are integrated via folder tabs into the Display Properties dialog box. Individual tabs let you change refresh rates on the fly, set hotkey combinations for pan and zoom functions, or adjust color mappings; resolution (desktop and virtual) and color depth changes are grouped under a slightly altered Settings tab. You cannot change color depths on the fly. ATI's Desktop Help says (erroneously) that Windows 95 does not support such "hot-switching," though we were able to with Diamond Multimedia's Stealth64, whose InControl Tools indeed let you hot-switch.

ATI GRAPHICS PRO TURBO

SUITABILITY TO TASK	
Graphics design	Good
Win 95 integration and stability	Good
2-D CAD	Excellent
Mainstream usability	Good



Based on ATI's aging Mach64 accelerator, the Graphics Pro Turbo performed relatively poorly on our Winbench 96 test suite, achieving barely half the Graphics WinMark 96 score of the fastest board in the review. Its Winstone results were also disappointing: The board tied for last place on the 16-bit version of Winstone 96, and stood alone at the bottom of the pack on the new 32-bit version of Winstone 96. The board had problems completing our automated Photoshop script: Both the Display Time and Overall Run Time results were significantly worse than any of the other products'. The Graphics Pro Turbo held its own on our DOS AutoCAD and Quark XPress performance tests, but those were the only performance bright spots.

The board's ability to sustain high refresh rates under demanding conditions, stable driver set and well-designed Windows 95 utilities indicate that, at the right price, the Graphics Pro Turbo provides a viable choice for general-business users and page-layout specialists. Graphic artists and other performance hounds will be better off looking elsewhere, however.—*Jon Hill*

ATI Graphics Pro Turbo. List price: $539; ATI Technologies Inc., Thornhill, Ontario, Canada.
(No Indian partner.)

Diamond Multimedia Inc.

Diamond Stealth64 Video 3400XL

Diamond Multimedia Systems has fleshed out its product line and changed its naming system since we last reviewed high-end graphics cards, and this Diamond Stealth64 Video 3400XL ($569 list, $484 street) is the same board as the Stealth 64 Video VRAM we awarded an Editors' Choice a year ago. Diamond has added new GT Drivers and InControl Tools for Windows95, and the board remains a solid all-around product.

The S3 968–based Stealth64 combines 4MB of VRAM (2MB on-board and 2MB daughtercard) and an IBM 9314 Palette DAC to provide a nicely saturated display. Diamond's new InControl Tools for Windows 95 are extremely versatile.

2-D GRAPHICS ACCELERATORS

How to Read the Suitability to Task Boxes

Though the sexier 3-D accelerators are grabbing all the limelight, 2-D graphics accelerators bring home the bacon for graphics professionals, DTP users, and the majority of CAD designers. These users demand color calibration, user friendliness, and strong AutoCAD capabilities.

SUITABILITY TO TASK	
Graphics design	Poor
Win95 integration and stability	Fair
2-D CAD	N/A
Mainstream usability	Excellent

N/A—Not applicable: The product does not support this feature.

To rate well in **graphics design,** a boards had to offer 24-bit true-color support at high resolutions. Color calibration and other creature comforts are also important.

Win 95 integration and stability is an important aspect to consider, since this is the dominant platform users will be working under. To do well here, a board had to be easy to set up and configure. It should be simple to change the refresh rate, and the card should offer advanced Windows 95 features such as true on-the-fly resolution switching and full integration into the Display Properties dialog box.

To rate an *excellent* in **2-D CAD,** a board must offer robust DOS AutoCAD support. AutoCAD for other operating systems such as Windows 3.1 and Windows NT is a plus. The board had to support high refresh rates at the highest resolutions for rock-solid image quality. It should also be able to support AutoCAD on more than one operating system.

Mainstream usability addresses overall performance on our Winstone and WinBench benchmark tests, as well as special bonus features such as bundled utilities, MPEG drivers, and upgrade paths.

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...ed complete: NT users won't get a ver-...n until after Microsoft releases Win-...s NT 4.0 later this year.

Setting up the Stealth64 Video 3400XL ...der Windows 95 was simple and straight-...rward. Start Windows 95 using its stan-...ed VGA display driver before installing ...e GT drivers and InControl Tools, and let ...Diamond's Install wizard walk you through ...e rest of the process. The DirectX-en-...bled drivers use Windows 95's monitor ...NF files to determine appropriate resolu-...ions and refresh rates for your monitor, ...t you can create custom configurations ...r new or unsupported monitors.

Once installed, the InControl Tools in-...egrate into Window 95's Display Proper-...ies sheet, and are easily accessible via a ...lick of the right mouse button on the ...Windows 95 background. You can do just ...bout anything with a click or two: change ...esolutions and color depths on the fly, ac-...ivate the virtual display, adjust the pan ...nd zoom hot keys, even start an applica-...ion with a click of the right mouse button. ...While you can't associate an application ...ith a resolution or color depth, it's not ...oo difficult to swap on the fly and then ...tart the application: two right-mouse ...licks will do the trick. Diamond provides ...n astonishing level of functionality ...hrough its InControl Tools; in fact our ...nly complaint was that the right-click ...menu can quickly fill up to the point of ...confusion. Fortunately, you can remove ...infrequently used items from the menu to ...keep it manageable.

STEALTH64 VIDEO 3400XL

SUITABILITY TO TASK	
Graphics design	Good
Win 95 integration and stability	Excellent
2-D CAD	Excellent
Mainstream usability	Excellent



The Stealth64 performed adequately ...n our suite of performance tests, though ...ther products have closed the perfor-...mance gap it enjoyed a year ago. Win-...bench performance, as measured by the ...Graphics WinMark 96, was squarely in ...the middle of the pack. Under Winstone ...%, the card fared somewhat better, but ...page-layout specialists will be disappoint-...ed by the card's poor performance on our ...automated QuarkXPress tests. The Stealth64 did somewhat better on our Adobe Photoshop 3.0 suite, where it finished roughly even with the top-scoring Matrox Millenium under Windows 95. AutoCAD performance under DOS, provided by Panacea's Turbo DLD Deluxe driver, was surprisingly good, but Diamond doesn't supply CAD drivers for Windows NT.

The company bundles a wide array of software extras with the Stealth64, including Asymetrix's 3D F/X, CorelDraw 4.0, and CompCore's SoftPEG software MPEG player. Diamond also offers an MPEG daughtercard ($299) for video playback.

By the end of the year, the Stealth64 Video 3400XL will be replaced by a 3-D–enhanced version of the card based on S3's Virge/VX accelerator. In the meantime, this solid offering is still a top choice.—*JH*

Stealth64 Video 3400XL. List price: $569. Diamond Multimedia Systems Inc., San Jose, CA.

(Indian partners Media Technologies, New Delhi; Sastek, New Delhi; Price: Rs 20,000 + taxes.)

ELSA Inc.

Winner2000 Pro/X4

Like vintage wines, graphics card drivers that cycle through our high end testing have good years and bad years. Unfortunately, this was a bad year for ELSA's Winner2000 Pro/X4 ($599 list), which performed poorly on our hardware benchmark tests and ships with outdated graphics utilities. Only those with a steady diet of Windows NT–based AutoCAD will find this board palatable: ELSA is the sole supplier of Windows NT AutoCAD drivers.

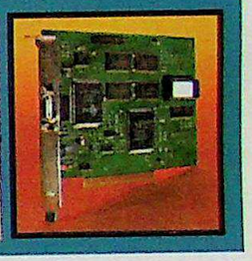
The Winner2000 Pro/X4 employs S3's Vision 968 graphics chip and Texas Instruments' 220 MHz TFP3026-220 PCE DAC, producing an adequate refresh of 80 Hz in 1,600-by-1,280 16-bit mode, and an outstanding 160 Hz in 800-by-600 24-bit mode. The Winner2000 Pro/X4 doesn't include 32-bit Windows 95 utilities, instead relying upon its Windows 3.1 programs to perform double duty. In addition to AutoCAD drivers for DOS, Windows 3.1, and NT, ELSA provides software MPEG drivers and Leadview's image management and compression software.

Working with ELSA's Windows 3.1 drivers on our Windows 95 test-bed was problematic. Trouble started during installation, which seemed to run normally but failed to copy over the required files or create program icons, which we did manually. Our woes continued when we tried loading the driver that activated ELSA's virtual desktop, which crashed on three different computers, and ultimately never worked on our bench systems.

Once running, ELSA's drivers proved stable, working through our application stress testing without incident. In addition to its basic configuration program, ELSA provides several useful utilities, including RunMan, a toolbar for one click application loading; ERGONOmeter, which measures refresh rate and scan frequency; and GAMMAman for color calibration.

WINNER2000 PRO/X4

SUITABILITY TO TASK	
Graphics design	Good
Win 95 integration and stability	Fair
2-D CAD	Excellent
Mainstream usability	Good



ELSA's software forte remains AutoCAD. All utilities are full-featured and mature, illustrating the depth of ELSA's experience in the CAD market. ELSA's Windows 3.11 drivers benefit from MULTIman, which lets users install up to three ELSA cards, each fully configurable to a unique view. A similar utility enables dual-screen mode in the Windows NT environment. But these creature comforts come at a pretty stiff price. ELSA ranked last or second to last in most hardware performance tests, taking over twice as long to complete the Zoom and Pan tests as our fastest boards. We contacted ELSA to confirm our results, and company officials stated that they were optimizing the drivers for re-release later in 1996.

The Winner2000 Pro/X4 placed a distant sixth of seven on our WinBench tests, proving slightly over half as fast as the speediest entries. Placement was similar on the Winstone tests, though the performance gap between the Winner2000 Pro/X4 and faster boards was much smaller. Windows application per-

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SUMMARY OF FEATURES

High-End 2-D Graphics Accelerators

■ YES ■ NO
Products listed in alphabetical order

	ATI Graphics Pro Turbo	Diamond Stealth64 Video 3400XL	ELSA Winner2000 Pro/X4	Hercules Terminator Professional	Matrox Millennium (PC MAGAZINE EDITORS' CHOICE)	Number Nine Imagine 128	Number Nine Imagine 128 Series 2
List/street price	$539, $435	$569, $483	$599, $500	None, $499	$549, $479	$699, $639	$699, $699
Graphics accelerator chip	ATI mach64	S3 Vision 968	S3 Vision968	S3 Vision968	MGA 2064W	Imagine 128	Imagine 128 Series 2
Data path	64-bit	64-bit	64-bit	64-bit	64-bit	128-bit	128-bit
Video acceleration/Color space conversion/3-D acceleration	■■■	■■■	■■■	■■■	■■■[1]	■■■	■■■
RAMDAC	IBM Palette DAC	TI TVP3026	TI TVP3026	IBM ESD 9314	TI TVP3026	TI TVP3026	IBM Palette DAC
RAMDAC speed	220 MHz	220 MHz	220 MHz	220 MHz	220 MHz	220 MHz	220 MHz
Display Characteristics							
Display memory included	4MB VRAM	4MB VRAM	4MB VRAM	4MB VRAM	4MB WRAM	4MB EDO VRAM	4MB EDO VRAM
Maximum installable memory	4MB	4MB	8MB	4MB	8MB	4MB	4MB
Maximum noninterlaced graphics resolution (dpi)	1,600 x 1,200	1,600 x 1,200	1,600 x 1,280	1,600 x 1,280	1,600 x 1,280	1,600 x 1,280	1,600 x 1,280
Maximum number of colors/Refresh rate at:							
1,600 by 1,280	65,000, 76 Hz	65,000, 76 Hz	65,000, 80 Hz	65,000, 72 Hz	65,000, 85 Hz	65,000, 83 Hz	65,000, 83 Hz
1,280 by 1,024	16.7 m., 60 Hz	16.7 m., 90 Hz	16.7 m., 83 Hz	16.7 m., 75 Hz	16.7 m., 110 Hz	65,000, 118 Hz	65,000, 118 Hz
1,024 by 768	16.7 m., 75 Hz	16.7 m., 120 Hz	16.7 m., 104 Hz	16.7 m., 90 Hz	16.7 m., 120 Hz	16.7 m., 150 Hz	16.7 m., 150 Hz
1,152 by 864	16.7 m., 60 Hz	16.7 m., 90 Hz	16.7 m., 82 Hz	16.7 m., 60 Hz	16.7 m., 120 Hz[2]	16.7 m., 150 Hz	16.7 m., 150 Hz
800 by 600 (Super VGA)	16.7 m., 100 Hz	16.7 m., 120 Hz	16.7 m., 160 Hz	16.7 m., 120 Hz	16.7 m., 200 Hz	16.7 m., 150 Hz	16.7 m., 150 Hz
Drivers and Software							
Supports Direct Draw/Direct Video	■■	■■	■■	■■	■■	■■	■■
Windows 95, Windows NT, OS/2 3.0 drivers available	■■■	■■■	■■■	■■■	■■■	■■■	■■■
AutoCAD driver	Proprietary	Panacea	ELSA Power	Panacea	Matrox	Panacea	Panacea
Driver directly supports DOS/Windows/Windows NT	■■■	■■■	■■■	■■■	■■■	■■■	■■■
Dual-screen support	■	■	■	■	■	■	■
Pop-up menus/Customizable pop-up menus	■■	■■	■■	■■	■■	■■	■■
Real-time pan and zoom/Bird's-eye view	■■	■■	■■	■■	■■	■■	■■
Display list processor/Graphics-mode text	■■	■■	■■	■■	■■	■■	■■
On-the-fly resolution adjustment/refresh rate control	■■	■■	■■	■■	■■	■■	■■
On-the-fly color depth adjustment	■ (Win 3.1 only)	■	□	□	□	□	□
Virtual Desktop features:							
Maximum size	2,048 x 1,536	2,048 x 1,536	1,600 x 1,200	1,600 x 1,200	1,600 x 1,200	3,200 x 1200	3,200 x 1200
Pan and zoom/Auto-centering	■■	■■	■■	■■	■■	■■	■■
Color calibration of RGB value/DPMS	■■	■■	■■	■■	■■	■■	■■
Video playback utility/Software MPEG	■■	■■	■■	■■	■■	■■	■■
Hotkey access to graphics utilities	■	■	□	■	■	■	■
Bundled third-party software	None	3D F/X, CorelDraw 4.0, Digital Video Producer	None	None	3D F/X, NASCAR racing	SoftMPEG 95	SoftMPEG 95
Web address (http://_____)	www.atitech.ca	www.diamond.mm.com	www.elsa.com	www.hercules.com	www.matrox.com/mga	www.nine.com	www.nine.com

(1) A 3-D driver set was not available for testing. (2) 1,152-by-882 resolution. m. = million.

formance verified the results, as ELSA placed last or second to last in QuarkXPress and Photoshop tests.

Over the last 12 months, ELSA stood still in a fast-moving market, falling behind in both hardware performance and software utility. CAD users may want to take a look, but others should pass until the company improves its drivers.—*Jan Ozer*

Winner2000 Pro/X4. List price: $599. ELSA Inc., Sanya Clara, CA.
(No Indian partner.)

Hercules Computer Technology

Terminator Professional

With above-average benchmark test performance and a competent set of graphics utilities, Hercules' $449 Terminator Professional is a solid choice for graphics professionals working in Windows 95. The Terminator Professional ships with DOS AutoCAD drivers, but provides only basic graphics support for Windows NT support and none for Windows 3.1 or NT AutoCAD.

The Terminator is built around S3's Vision 968 graphics chip and IBM's ESD 9314 220-MHz DAC, which combine to provide middle-of-the-road refresh rates in big-screen, high-color modes. For example, the refresh rate in 1,280-by-1,024 24-bit mode was only 75 Hz, and dropped to 72 Hz in 1,600-by-1,200 16-bit mode. While acceptable for occasional tasks, these rates would prove tiring for professionals who live in these resolutions.

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The card ships with drivers for Windows 3.1, 95, and NT, as well as Panacea's DOS AutoCAD drivers. The graphics display utilities are for Windows 3.1 and Windows 95 only. Hercules also supplies color calibration software and a Windows 95 Entertainment Center for controlling CD, MIDI and .WAV audio, Video for Windows, and software for MPEG playback.

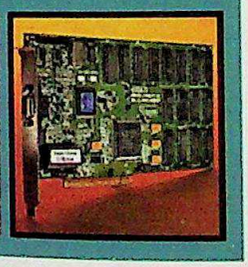
Installation of the Terminator's standalone graphics control program, Touch 95, was straightforward. Features include a virtual desktop with pan lock and autocentering, up to 8X zoom, and control over resolution, color depth, and refresh rate, with preview and screen adjustment. You can change refresh rate and resolution (but not color depth) without rebooting Windows 95.

Fast access to Touch 95 is provided via a selectable hot key or a small optional monitor icon on the Windows 95 taskbar. Touch 95 contains several nice surprises, like a refresh rate meter and comprehensive contact screen and help files.

The Terminator also delivers Color

TERMINATOR PRO

SUITABILITY TO TASK	
Graphics design	Good
Win 95 integration and stability	Excellent
2-D CAD	Fair
Mainstream usability	Excellent



Right, a capable color calibration program that enables gross monitor adjustments for room lighting, system gamma, and color temperature, and precise RGB adjustment and gamma controls. Color Right is compatible with the Chroma Calibrator, a hardware device from Sequel Imaging for more exact calibration.

While the Terminator was generally the fastest 968-based board on our tests, S3's graphics mainstay is showing its age against faster, more highly tuned chip sets. With the exception of low scores on 2-D CAD tests, it performed very well across our benchmark tests, almost tying with Matrox on the Winstone 96 tests. Visually, the card produced crisp 24-bit images in 1,280-by-1,024 resolution despite the relatively low refresh rates.

By focusing on Windows 95 to the exclusion of Windows NT or CAD, Hercules' Windows 95 creature comforts rival the best in the category. Windows NT professionals and non-DOS AutoCAD users may want to look elsewhere, but Windows 95 users who value a cushy ride over the ultimate in speed may take to the Terminator.—*JO*

Terminator Professional. List price: $449. Hercules Computer Technology, Fremaont, CA. *(No Indian partner.)*

Matrox Graphics Inc.

Millennium

Readers who follow the high-end graphics market know that Matrox is a consistent



category leader, and this year is no exception. Affordably priced at $470 on the street ($549 list), the Millennium bests the field in many hardware performance tests, offers exceptional screen refresh rates, and ships with stable, advanced graphics utilities for AutoCAD and all flavors of Windows.

While it's a great buy for desktop publishing and image editing, don't purchase this board for its claimed OpenGL 3D support: On our tests, we found no discernible benefit from the hardware 3-D acceleration. Matrox has dubbed that driver "defective" and says a replacement is in the works. Still, it is the best all-around 2-D board in this roundup and our Editors' Choice in that category—and an even better deal with an anticipated price cut to around $400 on the street.

The Millennium is based on Matrox's 64-bit MGA-2064W graphics chip set, with video acceleration, 4MB of Windows RAM, and Texas Instruments' 220-MHz DAC. The Millennium produced a rock-solid refresh rate of 102 Hz at 1,600-by-1,200 16-bit color depth—30 percent higher than the slowest boards here.

The Millennium ships with an elegant set of CD-ROM—based Windows 95 utilities that are neatly integrated into Windows 95 Display Properties controls. In addition to controls over resolution, color depth, and virtual window, Matrox lets you select four discrete graphic configurations, accessible via a Quick Access toolbar. You can quickly toggle between 640-by-480 8-bit mode for word processing and 1,280-by-1,024 24-bit mode for image editing—a time-saver if you frequently change graphics configurations.

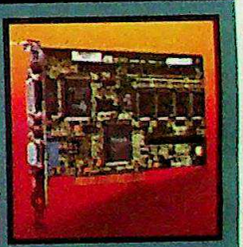
Our test product arrived with a less complete color management utility, but Matrox plans to include the color management utility by Sonnetech. Overall, our only complaint was that Matrox didn't include help files with its utilities, instead supplying on-line documentation in Wordpad format. This proved cumbersome when searching for quick answers.

The Millennium sailed through real-world evaluation in both Windows 95 and Windows NT without compatibility or stability problems. We did notice some jerkiness during slow panning in virtual screen mode, with the mouse jumping about an inch when touching an edge rather than sliding pixel by pixel. While certain other boards shared this characteristic, the movement from the Millennium was more pronounced.

The Millennium placed second on WinBench tests and first on Winstone 96 and Winstone 32 tests, which predict per-

MILLENNIUM

SUITABILITY TO TASK	
Graphics design	Good
Win 95 integration and stability	Excellent
2-D CAD	Excellent
Mainstream usability	Excellent



formance in 16- and 32-bit applications. Matrox provides comprehensive AutoCAD utilities for Windows 3.1 and DOS, but not for Windows 95 or NT. The Millennium was a strong performer on our DOS AutoCAD tests, and the depth of Matrox's AutoCAD utilities makes the Millennium an excellent choice for AutoCAD users.

In short, the Millennium offers outstanding price/performance characteristics for those interested in image editing and desktop publishing. Unless you're working on AutoCAD on the Windows NT platform, the Millennium should definitely be on your short list.—*JO*

Millennium. List price: $549. Matrox Graphics Inc., Dorval, Quebec, Canada. *(Indian partner Benchmark Microsystems, Ceebros Arcade, Sardar Patel Road, Adyar, Madras 600020. Tel : 413866; Price: Rs 20,000 at low-end, Rs 40,000 at high-end.)*

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Number Nine Visual Technology

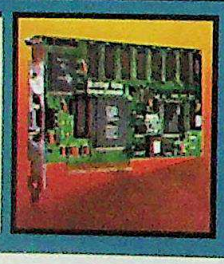
Imagine 128, Imagine 128 Series 2

Both the Imagine 128 ($699 list) and its newer sibling, the Imagine 128 Series 2 ($699 list) combine top-flight performance with exceptional utilities and productivity tools. An Editors' Choice in last year's high-end review, the Imagine 128 has aged well, and remains an excellent choice for handling large bitmaps and vector graphics. The Series 2 boasts a souped-up 2-D graphics engine, and as-yet untapped features that promise to deliver enhanced video and 3-D capabilities as well.

Both cards feature Number Nine's Hawkeye95 display control utilities, a user-oriented suite that is among the best designed in the business. Accessible via the Display Properties dialogue or directly from the Windows 95 taskbar, Hawkeye95's individual components work together to form an integrated set of tools.

IMAGINE 128

SUITABILITY TO TASK	
Graphics design	Excellent
Win95 integration and stability	Excellent
2-D CAD	Excellent
Mainstream usability	Excellent



Valuable features include an excellent Status page that lists everything from the current resolution and driver version to the bus size and BIOS revision. A simple but effective Monitor Adjustment utility lets you safely adjust the refresh rate and create custom configurations, and a well-designed color calibration utility called Color Perfect includes individual linear adjustments in RGB or CMY color space.

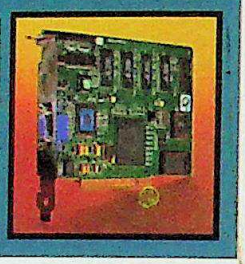
The Imagine 128 and Imagine 128 Series 2 run neck and neck at the top end of the 2-D accelerator market. Each delivers super fast refresh rates, topping out at an astounding 83 Hz in 1,600-by-1,200 16-bit color mode—if you can afford a monitor to handle that combination.

While we were unable to test the Series 2's performance in several areas—the card's MPEG and CAD software arrived after we had completed testing, and its OpenGL drivers for Windows NT remain unavailable as of this writing—a look at the card's WinBench 96 scores provides some insight into the chip's raw capability. At a resolution of 1,024-by-768 in true color mode, the card achieved an excellent Graphics Winmark score of 26.5. To put this in perspective, consider that most current midrange products process roughly the same number of pixels in 256-color mode as the Series 2 processes in true-color mode.

Under Windows 95, the early Series 2 drivers we tested did not completely deliver on the new chip's promise, but were solid and complete and include advanced DirectDraw support. The card is expected to scale nicely as Pentium Pro processors and 64-bit PCI buses enter the market, thanks in part to its Intelligent Command Processor and support for PCI bursts.

IMAGINE 128 SERIES 2

SUITABILITY TO TASK	
Graphics design	Excellent
Win 95 integration and stability	Excellent
2-D CAD	N/A
Mainstream usability	Excellent



The older Imagine 128, no performance slouch itself, was the fastest Photoshop and QuarkXPress engine, finishing just ahead of the Series 2.

If you want rock-solid images and the best tools in the business, consider either Imagine card. As Number Nine improves the breadth and depth of the Series 2 drivers, this promises to be the card to watch.—JH

Imagine 128. List price: $699. **Imagine 128 Series 2.** List price: $699. Number Nine Visual Technology, Lexington, MA.

(No Indian partner.)

OpenGL 3-D Accelerator Cards

AccelGraphics Inc.

AccelR8

ALL REVIEWS BY LINDA AND ERICK VON SCHWEBER

AccelGraphics, formed after the dissolution of Kubota Denali Graphics, is known for high-performance 3-D engines. The AccelR8 ($1,295 list) is the company's first attempt at a scaled-down, entry-level product for the price-conscious purchaser. The AccelR8's performance was average, but the relatively low price means some tradeoffs in functionality.

The AccelR8 does not have an [illegible] board VGA chip, so you must use the [illegible] cluded external pass-through cable. [illegible] reviewed an early version of the Accel[illegible] and experienced a driver problem [illegible] stallation, which AccelGraphics [illegible] corrected. The manual provided is spa[illegible] but accurate. The AccelR8 comes with [illegible] 16-bit z-buffer. This posed no compat[illegible] ity problems for any of the software [illegible] used in testing, and the card can be eas[illegible] expanded to a full 24-bit z-buffer by [illegible] user with an optional daughtercard.

In testing, we were limited to 800-[illegible] 600 15-bit color mode, as the Accel[illegible] lacks support for double-buffered [illegible] color and true-color modes in both 640-[illegible] by-480 and 1,024-by-768. Since it lacks tex[illegible] ture assist and support for a 640-by-[illegible] high-color mode, we could not use it [illegible] VR, VRML, or simulations—applicati[illegible] which seek to maximize performance [illegible] keeping to low resolution and 15-bit col[illegible]

In 800-by-600 15-bit mode, however, the AccelR8 fared well for an entry-level product in our simulation test and in han[illegible] dling transparency, outshining the simi[illegible] larly priced Fujitsu Sapphire 3D Design[illegible] in these areas. Only in the texture test [illegible] the AccelR8 fall to an unacceptable level of performance.

ACCELR8

SUITABILITY TO TASK	
Visualization	Fair
3-D Cad/CAE	Fair
Virtual reality	N/A
3-D animation	Fair
2-D CAD	Good



AutoCAD results place it mid-field, and AccelGraphics offers a driver add-on called AccelView ($399) that makes working with 3-D objects easier. This utility, which can be used with any AutoCAD driver, lets you grab and spin an object with the mouse, rather than having to enter rotational coordinates in degrees.

Without a high-color, double-buffered high-resolution mode we could not recommend the AccelR8 for the 3-D animator or high-end CAD user. But if your visualization work does not require texture support, or if your design work can be performed with 8-bit color, then the AccelR8 may work for you.

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Digitized by Arya Samaj Foundation Chennai and eGangotri

...ccelGRX. List price: $1,295. AccelGraphics, ...n Jose, CA; http://www.accelgraphics.com.

...n Indian partner.)

...mond Multimedia Inc.

Diamond FireGL

The Diamond FireGL is an accelerator card in transition, getting both a new processor and a new owner. The ...995 3-D accelerator is designed and manufactured by SPEA of Germany, a long-time maker of high-end cards. The FireGL represents a move onto a new accelerator chip, the Glint 300SX from 3D Labs. Diamond Multimedia recently acquired SPEA, and has repackaged the FireGL for U.S. customers.

Unfortunately, problems with the FireGL began early in our experience. We first tried to install the repackaged FireGL card. The installation instructions were seriously at odds with the supplied floppy disks and CD, making installation impossible. So instead we installed and tested the German version, packaged by SPEA. We later received a new package from Diamond. Though the installation instructions were improved, the drivers would not install, spawning Windows error messages. Like its German twin, the finished U.S. version will deliver support for Direct3D and Windows 95, and an enhanced 3-D viewer for AutoCAD in Windows.

The FireGL supported all the resolutions and color depths our testing required, up to 24-bit at 1,024-by-768, but overall it was at the bottom of the performance heap. Only on the texture test did the FireGL earn special 3-D attention, where it posted the second-best score of the cards we tested. In AutoCAD testing the FireGL preferred the WHIP driver, generally returning average scores except for regenerates, where it placed second, just behind the ELSA GLoria 8.

The unit's test results make it tough to recommend the present iteration of the FireGL for visualization and 3-D animation tasks. With the proven Glint engine and SPEA's track record, the board could mature into a viable choice, once Diamond works out the rough edges.

DIAMOND FIREGL

SUITABILITY TO TASK	
Visualization	Poor
3-D Cad/CAE	Poor
Virtual reality	Fair
3-D animation	Poor
2-D CAD	Good



Diamond FireGL. List price: $1,995. Diamond Multimedia Inc., San Jose, CA; http://www.diamondmm.com.
(Indian partners Media Technologies, New Delhi, Sastek, New Delhi; Price: Rs 18,500 + taxes.)

Dynamic Pictures

V192 Graphics Accelerator Module

The V192 Graphics Accelerator Module is an ideal high-end 3-D CAD board, able to maintain respectable real-time performance right up to 1,280-by-1,024 resolution at 24-bit true color. With a list price tag of $4,000, the V192 isn't for everyone. But it enables you to perform complex CAD/CAE chores on a PC that would otherwise require a more expensive workstation.

Installation was simple and direct, and since the V192 features an onboard 2-D chip you'll need no pass-through cable. In testing we noticed no visible performance hit in 2-D GUI operations as we moved up to higher resolutions. The documentation provided is accurate but sparse. Drivers are included for Windows NT for Alpha AXP, Intel, and MIPS platforms. Installation follows the Windows NT norm, using the Display icon of the control panel.

Most of the boards we reviewed can claim acceptable performance at low resolutions and shallow color depths, but the V192 delivers performance across the spectrum. In changing resolutions from our minimum 640-by-480 display to a full 1,280 by 1,024 pixels, the frame rate of the Dynamic Pictures V192 dropped

3-D GRAPHICS ACCELERATORS

How to Read the Suitability to Task Boxes

The high-end OpenGL accelerators we reviewed can be used for a range of tasks, the most popular of which we evaluate here. To rate the boards, we analyzed test results at color depths and resolution appropriate for each task, checked image quality, and looked at the array of specific features offered. Quick frame rates and accurate effects are the hallmarks of a winner.

SUITABILITY TO TASK	
Visualization	Poor
3-D Cad/CAE	Fair
Virtual reality	Good
3-D animation	Excellent
2-D CAD	Excellent

Visualization tasks aim to answer questions such as "What does data mean?" or "Will flap A fit into slot 5?" This requires high resolution, accurate color, and real-time performance. To earn a rating of *excellent*, a board had to deliver 1,024-by-768 and 1,280-by-1,024 resolutions in 15- and 24-bit color depths, handle simple and complex models, and support transparency.

For **3-D CAD/CAE**, users employ full 3-D, with smooth-shaded views in high resolution. Better accelerators deliver 1,024-by-768 and 1,280-by-1,024 resolutions across both simple and complex models as well as offering real-time walkthroughs. The board should also be compatible with Microstation, Pro/Engineer, and Pro/JR., the CAD programs of this genre.

Virtual reality, including VRML and simulations, demands the highest frame rates for a lifelike feel. These applications use optimized models (reduced number of polygons) and simple texture maps to add detail and richness. To earn an *excellent*, an accelerator needed to yield very high frame rates at 640-by-480 resolution.

Professional **3-D animation** and modeling works at high resolution and the highest color depths, employs transparency and textures, and requires substantial acceleration for real-time previews. For this task we looked for usable performance at high color in 800-by-600 and 1,024-by-768 and true color at 1,024-by-768 and 1,280-by-1,024, all double buffered.

Many of the boards tested can serve double duty as accelerators for **2-D CAD** programs. We looked for uniform results across pans, zooms, erase, regenerates, and 3-D twist, in 1,024-by-768 8-bit color mode.

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BENCHMARK TESTS

High-End Graphics Boards

PC MAGAZINE LABS

With most of the older 2-D Windows accelerator boards beginning to show their age, one thing is clear: Driver optimization for improved performance under Windows 95 is still at the top of each developer's to-do list.

What the Numbers Mean

Even after all testing was completed, each vendor asked for additional testing with its latest, newest improved driver. This was such an issue that we allowed vendors to submit a second round of drivers on March 29, just before the end of our testing cycle.

The PC has entered the workstation world. A Pentium Pro PC, coupled with an appropriate 3-D accelerator and OpenGL application, is impressive at many 3-D tasks, including CAD, visualization, animation, and virtual reality.

2-D Test Analysis Our QuarkXPress and Adobe Photoshop tests tell the story of 24-bit graphics performance. Products optimized for vector graphics processing turned in the best results in QuarkXPress. We broke out the captured results for file open time, time spent performing the multiple zoom operations, and vertical scroll operations. The Number Nine Imagine 128 board proved to have the best performance overall in QuarkXPress applications. It's interesting to note the performance differences among the Diamond, ELSA, and Hercules boards, which are based on the same S3 968 controller. Since hardware processing power is essentially the same, depending on the speed the vendor drives the controller's memory clock and RAMDAC's dot clock, driver optimizations are what seemed to give the Hercules Terminator Pro its edge.

Photoshop tests showed a mixed bag of results. Our Photoshop chart presents both Display Time and Overall Time. The Display Time denotes the total time Photoshop spent waiting for the graphics board to draw the screen. The Overall Time represents the total time it took to run the complete test. In some cases the fastest Display Time performer was not the fastest Overall Time performer. For example, the Matrox Millennium achieved the best Display Time, probably because of its use of WRAM, which has added dexterity in accelerating 24-bit-color bit block transfers, but the Number Nine Imagine 128 achieved the best Overall Time. The ATI Graphics Pro Turbo had difficulty running our Photoshop tests—which were compiled in Visual Test 4.0—and therefore receives an N/A.

The ZD Graphics WinMark 96 and Winstone 96 tests are measures of mainstream performance. They are not designed to perform operations that are native to 24-bit graphics applications. The New Number Nine Imagine 128 Series 2 was the fastest Graphics WinMark performer, proving the strength of the new controller over its older sibling, the Imagine 128, but this also points out the need for more 24-bit driver optimization, since this strength didn't translate as obviously to our QuarkXPress and Photoshop trials. The Millennium proved to be the top performer on our

Adobe Photoshop

Seconds	Display Time
ATI Graphics Pro Turbo	N/A*
Diamond Stealth64 Video 3400XL	10.2
ELSA Winner2000Pro/X2	13.0
Hercules Terminator Pro	11.2
Matrox Millenium	9.8
Number Nine Imagine128	12.4
Number Nine Imagine128 S.2	12.1

N/A*—Not applicable: Our automated test could not produce an accurate result. N/A**—Not applicable: There were no AutoCAD drivers a

◀BETTER

3-D CAPABILITY (1,024-by-768)

Frames per second	Rotate Simple Object 15/16-bit color	Rotate Simple Object 24-bit color	Rotate Complex Object 15/16-bit color	Rotate Complex Object 24-bit color	Rotate Textured Object 15/16-bit color	Rotate Textured Object 24-bit color
AccelGraphics AccelR8	N/A=	N/A=	N/A†	N/A†	N/A†	N/A†
Diamond Fire GL	5.8	5.2	3.5	3.1	1.5	1.4
Dynamic Pictures V192	N/A ††	13.2	N/A ††	8.3	N/A ††	1.8
ELSA GLoria 8	10.1	9.6	7.6	7.4	1.8	1.6
Fujitsu Sapphire 2SX	9.6	1.5	7.1	1.4	1.6	N/A†
Fujitsu Sapphire 3D Designer	N/A†	N/A†	N/A†	N/A†	N/A†	0.3
Oki TrianGL 16P	9.3	N/A†	3.9	N/A†	0.3	1.5
Oki TrianGL 24P	10	10.5	4.1	3.7	1.5	1.5
Omnicomp 3Demon	8.9	6.9	6.6	5.4	1.5	N/A††
Symmetric GLyder 16	10.2	8.0	10.5	8.1	N/A††	
Intergraph TDZ 300 Workstation[1]	N/A††	17.3	N/A††	18.1		
	BETTER▶	BETTER▶	BETTER▶	BETTER▶	BETTER▶	

(1) Reported for comparison.
N/A†—Not applicable: The product could not complete this test. N/A††—Not applicable: This product supports only 24-bit color depth.

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...stone tests. It excelled on the new Winstone 32 test, and performed slightly better than the Terminator Pro under Winstone 96. The AutoCAD for DOS performance chart shows the Panacea-equipped drivers as the faster performers. Except for the Hercules card which turned in the slowest results, other boards running those drivers performed similarly. The differences of a few seconds either way can be attributed to raw hardware speed.

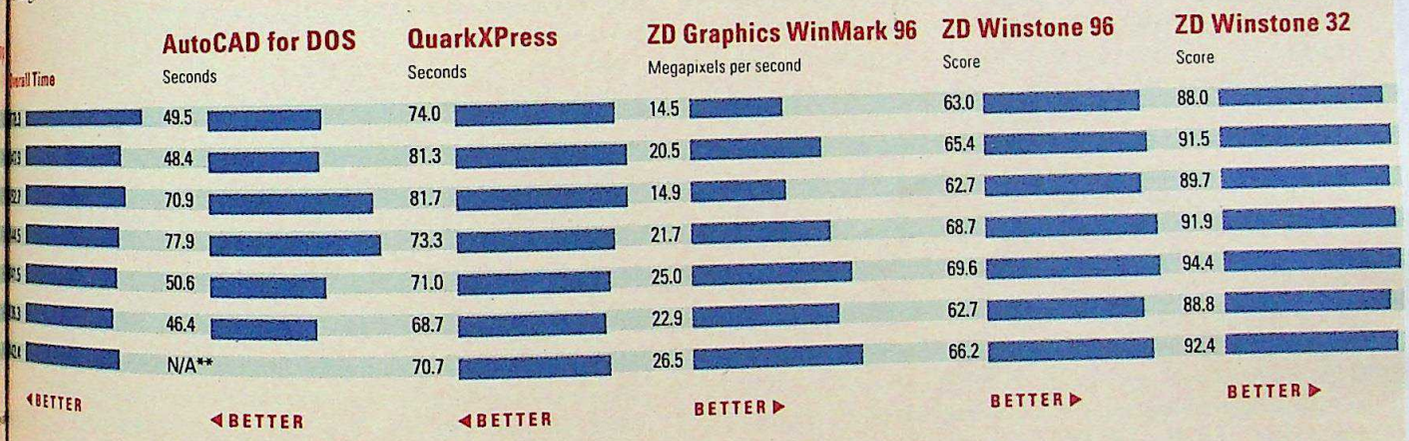
In many cases products performed within narrow margins of each another across many tests. Driver optimization techniques can easily account for one or two performance points, which can immediately change the ranking order from first to third place. That's why *PC Magazine* views performance as only part of the total picture. A new optimization scheme has emerged for Windows 95, bypassing the operating system's Graphics Device Interface (GDI) and patching common calls for faster processing by the graphics hardware. Matrox and Number Nine have told us they use this technique. Other vendors, like Diamond, state they don't use it because of certain compatibility issues. Part of the controversy over this technique is that it may cause instability under certain applications. Although we have not seen any problems in this round of testing, we will continue to monitor the situation. At the time of this writing, we are awaiting Microsoft's position on this issue.

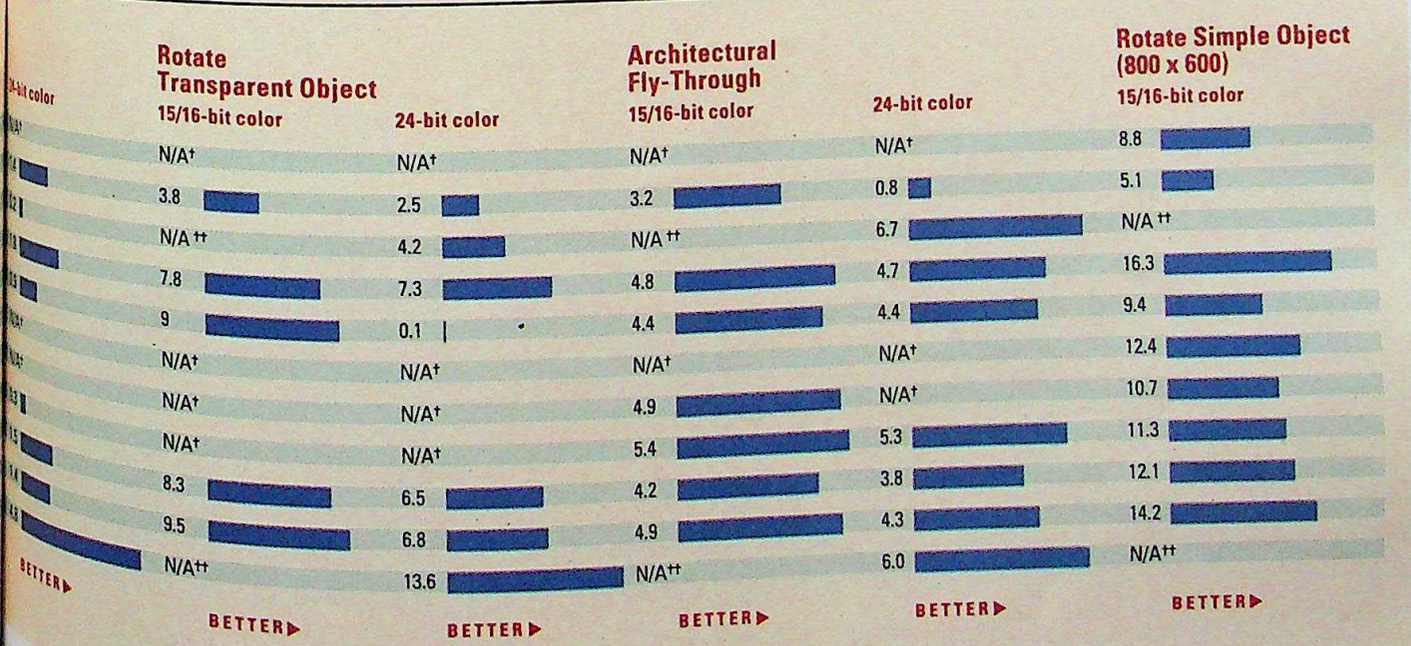
3-D Test Analysis Take a Pentium Pro PC and equip it with a fast 3-D accelerator board, such as the Symmetric GLyder 16 or the Dynamic Pictures V192, and you'll experience performance and functionality that two or three years ago could be found only on a 3-D Unix workstation. We were able to rotate, translate, fly through, and interact with smooth shaded 3-D models in real time. Lighting and transparency could be freely used. The same cannot be said for texture mapping. Texture "assist," supported on most of the Glint-based boards we examined, is limited in both performance and usefulness. Look for more robust texture handling to make the transition from laboratory to marketplace in the near future.

We found each accelerator to have its own strengths and weaknesses. The performance figures on our 3-D Capability tests characterize each board across tests relevant to visualization, 3-D CAD and engineering, and 3-D animation. The GLyder swept these tests overall, in large part thanks to its Delta geometry preprocessor from 3D Labs, a distinction it will not maintain once other vendors begin shipping their Delta-assisted cards based on 3D Labs' Glint chip. Should your needs fall squarely in the 3-D CAD/CAE realm, then the Dynamic Pictures V192 is the choice solution; its performance is right up there with entry-level workstations.

VR and Simulation present different requirements and demand

continues





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BENCHMARK TESTS

continued

utmost real-time performance. The Virtual Reality/VRML test focuses on factors required for these applications at the combination of resolution and color depth that optimizes performance and is compatible with VR peripherals. Both the GLyder and the Fujitsu Sapphire 2SX proved themselves here with the right feature support and performance that crossed the subjective threshold of 10 fps, where motion begins to appear fluid to the human visual system.

The performance of an accelerator card degrades as you ask it to render more information. Our Rotate Simple Object test portrays each accelerator across a variety of resolutions and color depths. A board like the Sapphire 2SX, exhibiting a wide performance spread, degraded sharply, whereas the Dynamic Pictures V192, exhibiting a narrow performance spread, degraded gracefully.

Until now, PC and 3-D workstations were far afield, differing in price, performance, and supported applications. This has changed. The OpenGL 3D accelerators we reviewed significantly improve the PC's 3-D performance without costing a fortune. On informal tests (not charted), our Editors' Choice—the Symmetric Glyder 16—demonstrated an overall improvement of 400 percent on 3-D operations compared with an unaccelerated 200-MHz Pentium Pro. The only deviation from this was for transparency, where the improvement was 2,000 percent, and textures, where it was 200 percent. This brings the PC's 3-D performance in line with entry-level 3-D workstations. This very significant performance can drive a range of professional 3-D applications now on Windows NT, including AVS/Express, Open Inventor, Sense8 World Up!, Parametric ProEngineer, and Microsoft SoftImage 3D, all functionally identical to their Unix cousins. The chasm has been bridged; the two worlds are one.

In informal testing, on a 100-MHz Pentium–powered Vectra XU we found the Symmetric GLyder 16 and the Dynamic Pictures V192 valuable, delivering about half the performance we saw when these boards were installed in our 200-MHz Pentium Pro test-bed. This means you can gain entry to the 3-D world by simply adding a 3-D card to your current Pentium PC and choosing portable, cross-platform software running on OpenGL.

Need still more power? Just move your OpenGL application to a higher-performance system. Today, 3-D performance gets cheaper the more you buy, no longer doubling cost for a 10 percent improvement. The Intergraph TDZ 300, which we tested for comparison, is an entry-level 3-D workstation that represents the next step up from 3-D accelerator cards in a Pentium Pro computer. The SGI Indigo2 High Impact exhibited the highest 3-D performance and the best price/performance ratio as well.

How We Tested

We tested the 2-D products on Micron Millenium 133-MHz Pentiums configured with 32MB EDO RAM and 256-Kb L2 cache. Each system was equipped with an Adaptec AHA-2940 PCI SCSI controller card using EZ-SCSI 4.0 software and drivers, Proteon 1392plus Token-Ring network interface card, Conner CFP 2107S (2.1GB) SCSI hard disk, a Plextor PX-63CS 6Plex CD-ROM drive, and the MAG Innovision MXP17F 17-inch monitor.

Our OpenGL 3D test-bed was the HP Vectra XU 6/150 updated with the 200-MHz Pentium Pro chip. Each system had 64MB of memory and a 2.1GB SCSI 2 disk. Graphics display was provided by the Matrox 2MB Millenium card, used as a pass-through device for those boards that lacked on-board VGA. Each system ran Windows NT 3.51 with Service Pack 3, along with Visual C++ 4.0. We used the same MAG Innovision monitors as in the 2-D test-bed.

Our OpenGL 3D benchmark tests were application-oriented. Popular OpenGL applications were utilized with performance meters tracking frames per second (fps) on a variety of 3-D models. Each test was conducted in high color at resolutions of 640-by-480, 800-by-600, and 1,024-by-768, and in true color at 1,024-by-768.

We also tested our performance leaders in an entry-level machine, an HP Vectra XU 5/100 powered by a 100-MHz Pentium. We found that these boards, the Symmetric GLyder 16 and the Dynamic Pictures V192, will provide good results in the Pentium you have now. Moving them into a Pentium Pro later will cause their performance to scale up accordingly: We saw performance just about double. This means that you can gain entry to the 3-D world by simply adding a card to your current PC and choosing portable cross-platform software running on OpenGL.

The refresh rate was 75 Hz and all modes tested required double buffering for smooth screen writes. We used AVS/Express, a high-end cross-platform data-visualization tool that allows users to interconnect prebuilt modules to construct sophisticated simulations. For our Simple Object test, AVS/Express was used in conjunction with the industry-standard teapot model consisting of 3,416 triangles, which we looked at smooth-shaded at 0 percent and 50 percent transparency. We also used the more complex

continued

VIRTUAL REALITY/VRML (640-by-480, 16-bit color)

Frames per second	Rotate Complex Object	Rotate Textured Object	Architectual Fly-Through	Dynamic Simulation
AccelGraphics AccelR8	N/A	N/A	N/A	N/A
Diamond Fire GL	4.5	2.5	8.2	11.8
Dynamic Pictures V192[2]	10.3	0.3	10.5	16.9
ELSA GLoria 8	9.2	3.4	10.5	16.4
Fujitsu Sapphire 2SX	8.7	3.0	10.8	20.0
Fujitsu Sapphire 3D Designer	8.0	2.6	9.3	14.0
Oki TrianGL 16P	3.9	0.5	7.9	12.5
Oki TrianGL 24P	4.2	0.5	8.2	15.3
OmniComp 3Demon	8.9	2.7	10.8	16.5
Symmetric GLyder 16	15.1	2.6	10.8	18.0

(2) Tested in 24-bit color mode.
N/A—Not applicable. The product could not complete this test.

BETTER▶ BETTER▶ BETTER▶ BETTER▶

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BENCHMARK TESTS

continued

Crambin molecular model, made of 400 interconnected spherical atoms for our Complex Object test.

Next up were two ports of Silicon Graphics. Open Inventor, the high-level 3-D SDK that builds on OpenGL and is the parent of VRML (Virtual Reality Modeling Language). Open Inventor is used to build interactive 3-D applications. It defines a 3-D metafile format, .iv, which is portable across platforms and contains the Inventor Scene Graph.

Portable Graphics, an Austin, Texas–based subsidiary of high-end image-generator manufacturer Evans and Sutherland, supplied its Windows NT port of Open Inventor in a late beta version. With its scene viewer we performed our Architectural Fly-Through test along a preset flight path through an SGI-supplied architectural model called Barcelona, consisting of 5,338 triangles, and we recorded minimum and maximum frame rates. For our Texture test, we loaded a 2,400-triangle model of 12 spheres, mapped with identical texture maps of the Earth and animated by Inventor Engines to spin at a fixed rate. The frame rate was recorded. For our Dynamic Simulation test we loaded an Open Inventor port from Template Graphics Software, and ran the SGI Slotcar demo. We ran it with a single car and calculated a representative frame rate for each product.

2-D AutoCAD (1,024-by-768, 8-bit color)

Minutes:seconds		
AccelGraphics AccelR8	2:50	
ELSA GLoria 3D³	1:49	
Diamond FireGL³	3:00	
Dynamic Pictures V192	N/A	
Fujitsu Sapphire 2SX	2:48	
Fujitsu Sapphire 3D Designer	2:42	
IXI TrianGL 16P	N/A	
IXI TrianGL 24P	2:22	
Omnicomp 3Demon	2:57	
Symantec GLyder 16	2:55	

① Tested with vendor-supplied driver.
N/A—Not applicable: The product does not support 1,024-by-768 resolution.

◀ BETTER

We used our new AutoCAD benchmark test to examine 2-D CAD performance in 1,024-by-768 8-bit-color mode. This test runs a series of AutoCAD operations and records the results. We tested under AutoCAD r13c4 under DOS and Windows NT 3.5.1, and we used either a Rasterex or Whip driver to achieve maximum scoring.

We looked at Intergraph's entry-level workstation, the TDZ300, with its GLZ1T accelerator, which offers texture mapping in hardware and dedicated texture memory. This platform utilizes the same 200-MHz Pentium Pro as our test-bed but includes 128MB of memory. Silicon Graphics facilitated our comparison tests by providing a complete Indigo2 system and system engineer. We used the High Impact, a 250-MHz MIPS R4400–powered machine.

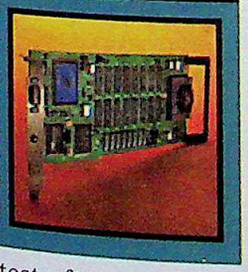
Our new Adobe Photoshop and QuarkXPress tests were developed in Microsoft Visual Test 4.0. Adobe Systems assisted in the development of portions of the Photoshop tests. The Photoshop tests open several graphics files, and performs several operations, including rotate, Gaussian blur, distort filter effect, zoom, and channel operations. We record the display time and total time to run the tests. The QuarkXPress test measures the time it takes to open a 14MB page layout file that contains text, bitmaps, and vector graphics images. The time for each set of operations is recorded.

For a complete description of our new Winstone 32 test program, see the "How We Tested" section of the PC story in this issue.—*Analysis written by Jeff Mace and Erick and Linda Von Schweber*

ss than 50 percent on our CAD task; pressive, considering that this resolu- n shift required over four times as ch information to be processed and splayed. By comparison, the overall rformance leader in this group, the mmetric GLyder 16, took a perfor- nce hit of 80 percent on the Architec-

V192 GRAPHICS ACCELERATOR MODULE

SUITABILITY TO TASK	
Visualization	Good
3-D Cad/CAE	Excellent
Virtual reality	N/A
3-D animation	Good
2-D CAD	N/A



ural Fly-Through test after we upped e resolution.

Unfortunately this significant achieve- ent comes at a price. While the Glyder 6 exhibits good performance across all st categories, the V192 suffers when ked to support alpha blending for ansparency, and falls on its face when asked to perform texture mapping, an OpenGL function it must execute in software only without the benefit of hardware acceleration.

Since engineering and design, such as mechanical CAD and solid modeling, require real time rendering at high resolutions but do not utilize transparency and textures, these shortcomings shouldn't effect the V192's target audience. But VRML and virtual reality developers will need to look elsewhere, at least for the time being. Symmetric reports that future versions of the V192 will accelerate texture mapping.

- Dynamic Pictures has plans to introduce lower cost accelerators with greater functionality than the V192 in the future. For now, users of 3-D CAD programs have a simple choice: the V192 or a very expensive workstation.

V192 Graphics Accelerator Module. List Price: $4,000. Dynamic Pictures Inc., Santa Clara, CA; http:// www.dypic .com. *(Indian partner Rolta India, Rolta Bhawan, MIDC-Marol, Andheri East, Bombay 400093. Tel: 8327708; Fax: 8365992.)*

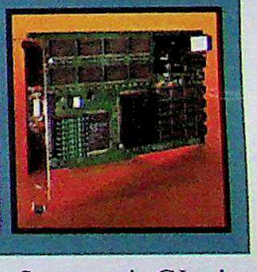
ELSA Inc.

GLoria 8

The ELSA GLoria 8 is an excellent all-around performer among Glint-based boards, suitable for every task we examined and a standout for 2-D AutoCAD work in particular. With a list price of $2,849 ($2,499 street), it's even competitive with the Symmetric GLyder 16, the champion on our tests, when the GLyder's unique Delta geometry co-processor is disabled. Look for a very promising entry when ELSA releases its Delta-assisted GLoria in late June.

GLORIA 8

SUITABILITY TO TASK	
Visualization	Poor
3-D Cad/CAE	Fair
Virtual reality	Good
3-D animation	Excellent
2-D CAD	Excellent



Among the GLoria's special features are support for digital video acceleration

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The Tools We Used: A Peek into the 3-D Domain

When Microsoft bundled OpenGL 3D into Windows NT, it opened a crack into the world of professional 3-D rendering. This crack is now a clear passage, thanks to video cards that accelerate OpenGL 3D functions to levels previously seen only on 3-D workstations. Our tests used OpenGL applications from the Unix world, now on NT.

AVS/Express, an impressive visualization tool, was used to examine two smooth shaded models: the famous teapot and a complex molecule. Next we turned to Open Inventor, an object-oriented 3-D toolkit developed by Silicon Graphics. Using Portable Graphics' port for NT, we conducted a fly-through of Barcelona, an archi-



Figure 1

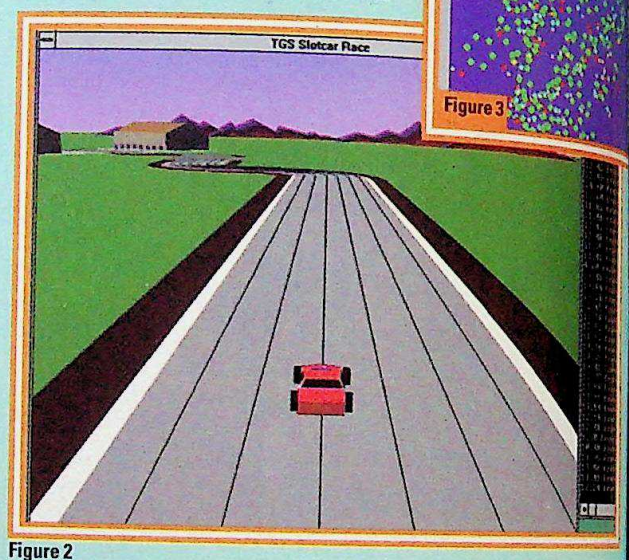
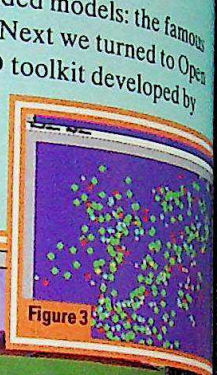


Figure 2


Figure 3

and provision for very high refresh rates—up to 200 Hz at 1,024-by-768. Several convenient Windows applets are included with the GLoria are. Installation followed the steps printed in the comprehensive manual, enabling us to get the GLoria up and running quickly.

ELSA has an absolute performance leader in the GLoria 8 for AutoCAD. With the included Heidi-based driver, the GLoria performs regenerates, pans, and zooms in AutoCAD about 3 percent faster than its closest competitor and 50 percent faster than most of the boards in this section.

On the rest of our 3-D test suite the GLoria was consistently strong. It excelled on our rotate textured object tests, beating all other reviewed boards, thanks to its superior use of the Glint chip's texture-assist feature. This makes it well suited to 3-D modeling and animation tasks.

The primary limitation of the GLoria for 3-D work is at very high resolutions and color depths: You can have 1,280-by-1,024 resolution or you can have 24-bit color, but don't ask for both at the same time, as the GLoria struggles when applying this combination. For instance, on our rotate simple object test at 24-bit color the GLoria delivered 9.6 fps at 1,024-by-768 but only 0.9 fps when we jumped to the higher resolution.

For now, the ELSA GLoria 8 is a good 3-D accelerator and a great AutoCAD board. If ELSA succeeds in maintaining the GLoria's strengths when it adds the Delta geometry chip, it will have another winner.

GLoria 8. List price: $2,849. ELSA Inc., Santa Clara, CA; http://www.elsa.com.

(No Indian partner.)

Fujitsu Microelectronics Inc.

Sapphire 2SX, Sapphire 3D Designer

PC MAGAZINE EDITORS' CHOICE

Both Fujitsu Sapphire boards deliver the performance and features that make them fine choices for a range of 3-D work. The higher-end Glint-based Sapphire 2SX ($1,989 list, $1,595 street) is a good all-around performer that stands out for use in virtual reality and simulation. The scaled-down Sapphire 3D Designer ($1,295 list, $995 street) is a price/performance standout and earns an Editors' Choice. It delivers strong performance on tasks from VRML to visualization and even CAD at all but the highest resolutions.

The Sapphire 2SX offers a number of convenient features. For instance, as the 2SX runs it posts records to the Windows event log should it encounter a system configuration that compromises performance. These reports can help in tuning the 2SX for optimal speed. The board's color-space double buffering, available at a color depth of 12 bits (4,096 colors), increases animation performance without the massive dithering that accompanies 16-bit color and offers a 10 percent performance improvement in frame rate. The 2SX's proprietary Pixel Bus architecture allows up to three Sapphires to be installed in one machine and joined together

SAPPHIRE 2SX

SUITABILITY TO TASK	
Visualization	Good
3-D Cad/CAE	Good
Virtual reality	Good
3-D animation	Excellent
2-D CAD	Excellent



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tectural model from SGI. Then we checked out texture handling with a simple scene of 12 rotating planets. Using an interactive 3-D application built with Template Graphics Software's Open Inventor port for NT we took a simulated race car for a spin around a simulated track.

—LVS and EVS

The screenshots we present here show some of the worlds that are opening to the PC workstation user.

Figure 1 Test: Rotate Simple Object. Software: AVS/Express. Model: Teapot, 3,416 triangles.

Figure 2 Test: Dynamic Simulation. Software: TGS Open Inventor. Demo: SGI's Slotcar.

Figure 3 Test: Rotate Complex Object. Software: AVS/Express. Model: Molecule, 400 spheres.

Figure 4 Test: Architectural Fly-Through. Software: Portable Graphics Open Inventor. Model: Barcelona, 5,338 triangles.

Figure 5 Test: Rotate Textured Objects. Software: Portable Graphics Open Inventor. Model: 12 Spheres, 2,400 triangles.

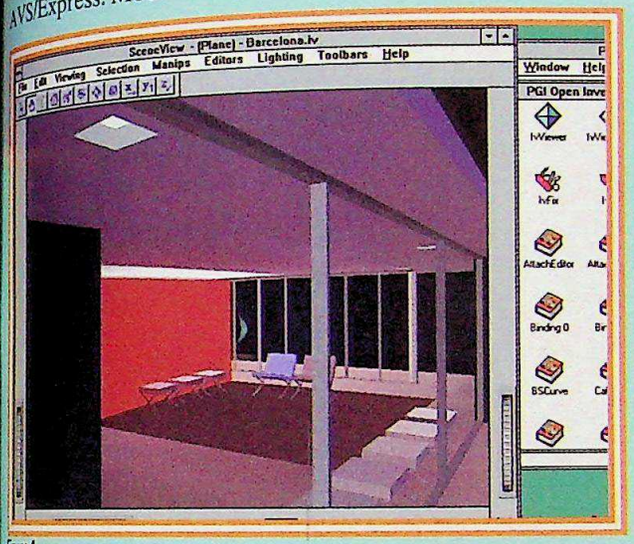


Figure 4

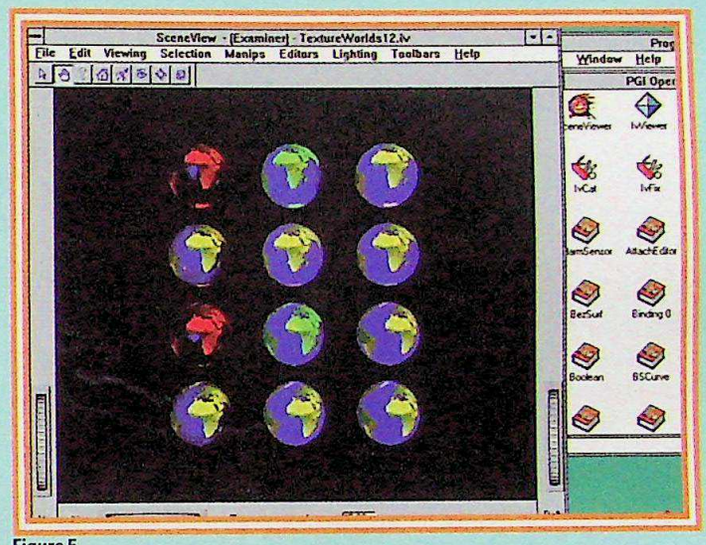


Figure 5

it. Such a configuration can be used either to improve performance in a single display system or to support a virtual world across multiple displays, as in a panoramic display.

The 2SX shows particular prowess for fly-throughs, texture mapping, and interactive simulation. It really shines in 640-by-480 15-bit color mode (or in a partial-screen decoder window at higher resolutions), scoring at the front of the pack on our fly-through, interactive simulation, texture mapping, and tranparency tests.

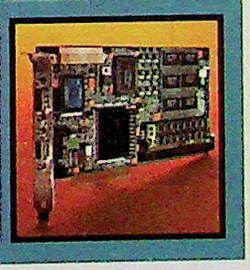
The Sapphire 2SX's low-resolution performance makes it eminently suitable for VR work and dynamic simulations. But it's no slouch on other tasks. The 2SX can handle modeling and animation, CAD, and visualization. For VR developers this is particularly good news, since the 2SX will serve them during the initial design phases of a VR project and then act as the real-time engine for deployment.

Fujitsu carried many of the 2SX's strengths over to its newer, more affordable Sapphire 3D Designer. It delivers 2MB of VRAM and 4MB of DRAM (as opposed to the 2SX's 4MB-by-4MB configuration), which means limitations in the video modes it supports with full double buffering. If you and your applications can live inside a 640-by-480 or 800-by-600 display, the 3D Designer can save you a great deal of money. It is ideal for those seeking to accelerate their VRML Web browsers for surfing the Internet in 3-D.

The 3D Designer's test results were generally in the middle of the pack though in several cases performance exceeded that of boards costing three times as much. With good support for textures, transparency, and fly-throughs, the Sapphire 3D Designer is a cost-effective solution for virtual reality and simulation applications.

SAPPHIRE 3D DESIGNER

SUITABILITY TO TASK	
Visualization	Fair
3-D Cad/CAE	Good
Virtual reality	Excellent
3-D animation	Good
2-D CAD	Fair



The 3D Designer is accompanied by superb documentation that belies its entry-level price. The user guide describes in informative detail the Designer's special features and user-customizable parameters, including the color-space double buffering offered on the Sapphire 2SX. Hardware installation was plug-and-play, requiring no jumpers and no DIP switch settings. Fujitsu plans on expanding the 3D Designer line with additional memory options and a planned Pro series with the 3D Labs Delta geometry coprocessor, the same chip that powered the Symmetric Glyder 16 to the top of our charts.

The Sapphire 2SX is an excellent all-around performer with a knack for VR and simulation work. If you're looking for such a combination you should seriously consider the Sapphire 2SX. If you're looking for an accelerator for 3-D Web browsing with VRML, simulation, virtual reality, visualization, or even CAD tasks that seldom require the highest video modes, then the Sapphire 3D Designer is your admission ticket to the world of 3-D—a ticket with a bargain matinee price.

Sapphire 2SX. List price: $1,989. **Sapphire 3D Designer.** List price: $1,295. Fujitsu Microelectronics Inc., San Jose, CA; http://www.fmi.fujitsu .com.

(No Indian partner.)

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SUMMARY OF FEATURES

High-End 3-D Graphics Accelerators

■ YES □ NO

Products listed in alphabetical order	AccelGraphics AccelR8	Diamond FireGL	Dynamic Pictures V192 Graphics Acceleration Module	ELSA GLoria 8	Fujitsu Sapphire 2SX	Fujitsu Sapphire 3D Designer (PC MAGAZINE EDITORS' CHOICE)	Oki TrianGL 16P
List/street price	$1,295, $1,295	$1,995, $1,995	$4,200, $4,000	$2,849, $2,600	$1,989, $1,595	$1,295, $995	$1,690, $1,392
2-D graphics do not require separate VGA controller	□	■	■	■	□	□	■
2-D chip manufacturer and model	None	S3 Vision968	Cirrus Logic GD5428	S3 Vision968	None	None	Proprietary
Display memory	2MB VRAM	8MB VRAM	16MB VRAM	8MB VRAM	4MB VRAM	2MB VRAM	7MB VRAM
3-D rendering chip manufacturer and model	3D Labs Glint 300SX	3D Labs Glint 300SX	Proprietary	3D Labs Glint 300SX	3D Labs Glint 300SX	3D Labs Glint 300SX	Proprietary
Geometry processor chip	None	None	None	None	None	None	None
Z-buffer memory	2MB DRAM	8MB DRAM	8MB VRAM	8MB DRAM	4MB DRAM	4MB DRAM	3MB DRAM
Z-buffer bit depths supported	16, 24*	16, 32	24	32	16, 24, 32	16	16
Accelerated double-buffered color depths (bits):							
640 x 480	8	8, 16, 24, 32	24	8, 15, 24	8, 12, 15, 24	8, 12, 15	8, 16
800 x 600	8, 16	8, 16, 24, 32	24	8, 15, 24	8, 12, 15, 24	8, 12, 15	8, 16
1,024 x 768	8	8, 16, 24, 32	24	8, 15, 24	8, 12, 15	8	8, 16
1,280 x 1,024	N/A	16	24	8, 15	8	N/A	N/A
1,600 x 1,200	N/A	16	N/A	8, 15	N/A	N/A	N/A
3-D Functions and API Support							
Supports flat-shaded polygons/Phong shading	■ □	■ ■	■ □	■ ■	■ ■	■ ■	■ □
Supports anti-aliasing/alpha blending	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	□ □
Supports stencil/fog/clipping	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■
Accelerates transparency	■	■	■	■	■	■	
Texture assist				■	■	■	
Drivers and Software							
OpenGL drivers available for:							
Intel Windows NT 3.5/Windows 95	■ ■	■	■	■ ■	■	■	■
MIPS Windows NT 3.5	□	□	■	□	□	□	□
DEC Alpha/PowerPC Windows NT 3.5	■	□	■	□	□	□	□
2-D drivers for Windows NT	■	■	■	■	■ ■	■ ■	■
2-D drivers for Windows 95	□	■	□	■	■	■	■
2-D drivers for OS/2 3.0	□	■	□	■	□	□	□
Autodesk AutoCAD Support							
Includes Windows NT 3.5 AutoCAD driver	□	■	□	■	□	□	□
Supports AutoDesk's Heidi	■	■	□	■	■	■	□
Supports AutoCAD bird's-eye zoom	■	■	□	■	■	■	□
Supports AutoCAD text window	■	■	□	■	■	■	■
Web address (http://_____)	www.accel.graphics.com	www.diamondmm.com	www.dypic.com	www.elsa.com	www.fmi.fujitsu.com	www.fmi.fujitsu.com	www.oki.com

* With memory upgrade. N/A—Not applicable: The product does not have this feature.

Oki Advanced Products

TrianGL 24P, TrianGL 16P

The Oki TrianGL 24P ($2,795 list, $2,200 street) and TrianGL 16P ($1,695 list, $1,400 street) accelerator cards were designed with a tight focus on the 3-D CAD user looking for a PC alternative to an entry-level workstation. The two TrianGL boards returned mixed results on tests related to 3-D CAD, sometimes competitive with the GLyder 16, the best on our tests, then falling below average on other tests. A surprise to us as well as Oki, both boards excelled on our AutoCAD tests.

TrianGL 24P

SUITABILITY TO TASK	
Visualization	N/A
3-D Cad/CAE	Fair
Virtual reality	N/A
3-D animation	N/A
2-D CAD	Good



These boards, based on Oki's graphics engine, differ in the amount of memory they deliver. The TrianGL comes equipped with 3.75MB of DRAM, while the 16P comes with 3MB—which means you'll have decide between high resolution and high color depth.

Because of Oki's specific market focus, we oriented our analysis to 3-D CAD at 1,024-by-768 resolution. Tests outside

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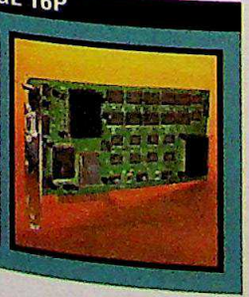
	Oki TrianGL 24P	Omnicomp 3Demon SX88	Symmetric GLyder 16
	$2,799, $2,199	$2,295, $1,959	$2,695, $2,695
	■		■
	Proprietary	None	Avance Logic
	12MB VRAM	8MB VRAM	8MB VRAM
	Proprietary	3D Labs Glint 300SX	3D Labs Glint 300SX
	None	None	Glint Delta
	3.75MB DRAM	8MB DRAM	8MB DRAM
	24	32	16, 24, 32
	8, 16, 24	8, 12, 16, 24/32	8, 12, 15, 24
	8, 16, 24	8, 12, 16, 24/32	8, 12, 15, 24
	8, 16, 24	8, 12, 16, 24/32	8, 12, 15, 24
	8, 16, 24	8, 12, 16	8, 12, 15
	N/A	8, 12, 16	8, 12, 15
	■	■■	■■
		■■	■■
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	■		■
	www.oki.com	www.phoenix.net/~omnicmp	www.symmetric.com

PC MAGAZINE EDITORS' CHOICE

view, at lower resolutions and for nsparency and texture, returned the w values expected. Don't even think of

TrianGL 16P

SUITABILITY TO TASK	
Visualization	N/A
3-D Cad/CAE	Fair
Virtual reality	N/A
3-D animation	N/A
2-D CAD	N/A



using a TrianGL for these functions. One exception: On our simulation test, the TrianGL 24P delivered speed competitive with our top performers.

The performance anomalies we saw disturbed us. For example, the TrianGL 24P performed acceptably on our architectural fly-through test in 1,024-by-768 24-bit color mode. But when we dropped back to 16-bit color depth, performance got worse rather than better.

We did discover the TrianGL boards to be exceptional 2-D AutoCAD performers, panning, zooming, erasing, and regenerating within seconds of our top AutoCAD performer, the ELSA GLoria. Be warned that 3-D CAD with complex models, as shown by our Rotate Complex Object test, will be less than acceptable. Oki reports that the boards are meant to reduce the cost of a 3-D CAD seat for simple design automation tasks and particularly for design review—not for designing a jumbo jet.

Buried in the Oki TriangGL accelerators is a high-performance engine that shows through on some tests and vanishes on others. Check it out with your specific app to see if it's strong where you need it. **TrianGL 16P.** List price: $1,695. **TrianGL 24P.** List price: $2,795. Oki Advanced Products, Oki America Inc., Marlborough, MA; http://www.oki .com.
(No Indian partner.)

Omnicomp Inc.

3Demon SX88

Omnicomp has been shipping Glint-based accelerator cards for the PC longer than any other vendor, and the 3Demon SX88 ($2,295 list, $1,960 street) shows it in the depth of its documentation, its ease of installation, and its driver support and special features. But this design is also showing its age: While the 3Demon is balanced and usable, it lags behind other Glint-based offerings from newcomers.

Special features abound. The 3Demon supports dual monitors and color-space double buffering for improved animation performance at 12 bit color depth. It also deliver Windows NT event logging to help you optimize your configuration. In addition to OpenGL, the 3Demon supports Argonaut's Brender 3D APIs, Microsoft

3Demon SX88

SUITABILITY TO TASK	
Visualization	Fair
3-D Cad/CAE	Fair
Virtual reality	Good
3-D animation	Good
2-D CAD	Fair



RealityLab, and Criterion's RenderWare.

The current 3Demon requires the use of a supplied external pass-through cable that connects to your existing VGA card or port. Once connected, the 3Demon installed without a hitch. The included documentation is extensive and provides detailed information on variables used to tune performance.

During testing, the 3Demon scored neither poorly nor exceptionally at any task. It turned in usable performance for tasks that required transparency, texture assist, and smooth shading. The board should prove competent for visualization and 3-D CAD uses, and good for 3-D animation and VR chores that don't require strong performance at higher resolutions. There is no double-buffered support for 1,280-by-1,024 24-bit true color, though Omnicomp is readying a new line of accelerators based on 3D Labs Glint 300DSX, incorporating the Delta geometry preprocessor.

If you're looking for an accelerator vendor with both a past and a future, Omnicomp should be on your list.

3Demon SX88. List price: $2,295. Omnicomp Inc., Houston, TX; http://www.phoenix.net/~omnicomp.
(No Indian partner.)

Symmetric Inc.

GLyder 16

PC MAGAZINE EDITORS' CHOICE

The GLyder 16, from Symmetric, is a high-end graphics board that excels at every 3-D task you send its way. Competitively priced at $2,695 (list), this Editors' Choice winner was the most consistent performer in our group, whether for visualization, engineering, animation, or virtual reality and simulation.

Installation was straightforward. No jumpers or switches need to be set. The documentation is brief but accurate, and has some welcome hints at optimizing GLyder performance both generally and

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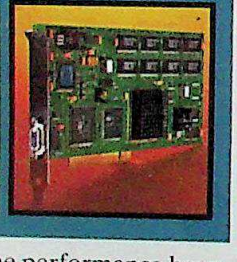
with Pro/Engineer, Microstation, Open Inventor, and I-DEAS 3D applications. The board also supports color-space double buffering for better animation performance without resorting to lowly 8-bit color.

The GLyder dominated our tests, thanks to its 3D Labs' Glint 300SX and new Delta coprocessor (it was the only board here to have the new chip). Geometry acceleration has been a hallmark of the high-end of professional graphics workstations such as the SGI Onyx Reality Engine/2. The Delta chip brings this concept down to the PC, offloading many geometry processing tasks that hamstring an Intel CPU.

The GLyder is a balanced performer, capable of maintaining a very high frame rate while handling transparency, texture mapping, rotations, translations, and scaling. While other boards showed one or two performance bright spots, in 1,024-by-768 24-bit color mode the GLyder was consistently at the top of the performance heap.

GLyder 16

SUITABILITY TO TASK	
Visualization	Excellent
3-D Cad/CAE	Good
Virtual reality	Excellent
3-D animation	Excellent
2-D CAD	Fair



The GLyder also exhibits usable performance even when coupled with a Pentium/100. The GLyder performed the Rotate Simple Object, Rotate Complex Object, Rotate Transparent Object, and Architectural Fly-Through Tests (at 640-by-480) on our HP Vectra 5/100 with aplomb. This means a GLyder can make for an effective entry-level 3-D solution coupled with a Pentium and later be moved into a Pentium Pro machine.

By the time you read this, Symmetric will also be offering the even more affordable GLyder 8 for those who don't need the highest resolutions and color depth modes. Symmetric is also planning a model built around the forthcoming Glint 300TX. For now, Symmetric has an outstanding offering for the professional 3-D user. To paraphrase the airline, the Delta-equipped GLyder loves to fly, and it shows. □

GLyder 16. List price: $2,695. Symmetric Inc., Dallas, TX; http:// www.symmetric.com. *(Indian partner Manhattan Associates, Bombay.)*

5

Good reasons for subscribing to *PC Magazine India*

The only Indian PC product evaluation magazine that conforms to international standards

1. *PC Magazine India* does not merely reproduce articles from *PC Magazine*. It adapts articles to Indian conditions by adding valuable inputs from the Indian market such as product availability, price in Indian rupees, value additions, names and addresses of dealers/resellers, and so on.

2. Each issue of *PC Magazine India* offers a wealth of information on the latest products released in the international market. The emphasis invariably is on practical aspects such as features offered, price advantages, quality, and performance.

3. The information published in *PC Magazine India* is authentic. Products are reviewed at PC Labs, acclaimed as one of the best adequately equipped testing labs in the world. PC Labs benchmarks are respected worldwide as among the most stringent and all-encompassing.

4. *PC Magazine India* also offers a panoramic view of the Indian IT industry. The coverage has drawn kudos from experts for being comprehensive, reliable, and timely. To conform to the high standards set by *PC Magazine*, information is sifted, processed, and cross-checked at every stage before being printed.

5. There is no other PC product evaluation magazine in India which gives as authoritative information as *PC Magazine India*. Which is the reason why readers have been jumping on to the *PCMI* bandwagon. Today, *PCMI* is the fastest growing computer magazine in India. You too should join the *PCMI* bandwagon; or you run the risk of becoming obsolete.

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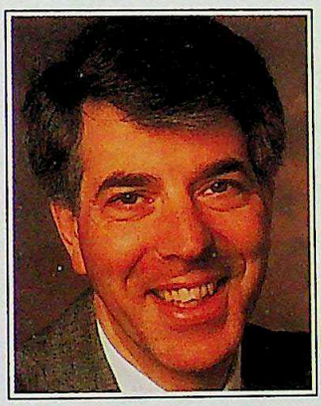
BILL MACHRONE

The Web-as-Platform Manifesto

We hold this truth to be self-evident: The Web is a platform. As such, it becomes the center of a universe, a gravitational force that attracts users and developers alike. Last year was the first time the Internet gave people a reason to buy PCs.

Although the Internet continues to be a factor, the 28.8-Kbps barrier has left a lot of users disappointed. Also, some of the content is long on promise but short on delivery.

As the local loop becomes digital within the next year or two, you'll leapfrog ISDN and be able to connect at anywhere from 300 kilobits to 6 megabits over your existing phone line. Faster line speeds will unleash a torrent of new content, which will require thousands of new servers and will sell millions more computers. Services will be speed-dependent, of course, but even the lower speeds will allow animation and audio to become commonplace. At the higher end will come videophones, interactive gaming, and video-on-demand MPEG movies. These next-generation apps will create a wave of new demand for hardware.



NET PREDICTIONS

Faster phone lines will unleash a torrent of new content and sell millions more computers.

This Web thing is weird. People are falling all over themselves to learn HTML, install TCP/IP-based networks and Web servers, use browsers as front ends to everything in sight, and generally reinvent computing. It almost defies comparison. You can buy a perfectly good car from a Chevy dealer, complete with no-rust-through warranty and 50,000 miles before the first tune-up. If Web mania were to hit the auto market, we'd all be buying four tires, a bunch of metal, some seats, some glass, and a welding torch from Sears to build our own cars.

Instead of using off-the-shelf solutions, people are rolling their own from a dog's breakfast of dialers, protocol stacks, databases, browsers, and middleware. We're taking a giant step backward in performance, maintainability, and security, but who am I to stand in the way of progress?

Sarcasm aside, this bottom-up movement is a grab for more user control and a thumping rejection of "big" solutions. Of course, today's little solutions will become tomorrow's big solutions as the inevitable consolidations, mergers, and strategic alliances occur. Functionality will increase, but unfortunately, so will complexity.

For 1996, the $500 Internet computer, or network computer, is a foolish pursuit, but it's an honest attempt by some of the moguls to turn the little solutions into big ones all the sooner, taking the complexity away from the user and putting it back into the IS department, where it belongs.

There's no doubt that you can build a $500 machine that will surf the Net, but the whole idea of loading your applications over the network is laughable, given the low speed of the local loop, crowded servers, and unpredictable backbone performance. Even applets, the small chunks of code promised by Java, don't mesh with most of our usage patterns. The whole idea of the network computer is not to store data locally. But can you imagine doing a spell-check over a modem linkup? Me neither.

The network computer begins to make sense in two scenarios. The first is when the line speeds go up and server performance begins to measure up to the tremendous load. The second is in business. We already have networks that deliver to our offices both bandwidth performance that we can only dream of at home and (usually) a sufficient amount of server performance.

Chances are, however, that even our last-generation equipment will outperform the typical network computer, so the argument remains weak. Of course, environments that require a high degree of security, control, or uniformity are prime candidates. These tend to be private networks that support point-of-sale terminals, factory automation, and secure systems. Will such applications be joining the tumult on the Web? I seriously doubt it.

Vendors such as Sun Microsystems are very good at the glib phrase, such as, "The network is the computer." *PC Magazine* has offered up a few good phrases as well, such as our wildly predictive T-shirt, circa 1987, that said, "If you're not connected, you're not computing." Both phrases are vastly more fitting today than when they were coined. Sun has offered up another one: "Java is the platform."

I don't think so. The Web is the platform, and Netscape is the chief embodiment of the Web. Java is a tool, no more, no less. Yes, it's a model of portability and a modernization of a thorny language (C++), but to call it anything else is wishful thinking. □

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WinHelp 4: Windows 95's Enhanced Help System

Build a help system for your Windows 95 app—five new tools give you all the help you need.

By Neil J. Rubenking

Help! That's what you need when your new Windows application won't behave. It's reassuring to know you can always click on the Help menu. Each time you do, you're relying on WinHelp, the Help utility supplied with Windows. WinHelp 4, the latest version designed for Windows 95 and shared with Windows NT 3.51, has quite a few new features. In this article, we'll explore the highlights of these features before taking a look at five of the Help design tools that support them: Doc-To-Help 2.0, ForeHelp 2.95, Help Magician Pro 95, RoboHelp 95, and HelpBreeze 2.0.



WinHelp 4 has a new look. In fact, it has a completely remodelled entrance. In earlier versions, the Help menu's standard items were "Contents," "Search for Help On," and "How to Use Help." All three are replaced in WinHelp 4 by a single item, "Help Topics," which brings up the Contents log. This three-page tabbed dialog is the entry to every WinHelp 4 Help system. The Contents tab lays out the Help-system hierarchy, the Index tab is simi-

IN THIS SECTION

TUTOR Long filenames are finally possible in Windows— thanks to Windows 95. But because compatibility with earlier versions of the operating system was a mandate for the designers of Windows 95, the long-filename feature is somewhat compromised. Find out what you need to know in order to use long filenames effectively and to avoid unwanted surprises.

INTERNET TOOLS Even if you're a beginning Web publisher, you'll discover lots of good reasons to include images in your online documents. Here we explore the common Web image formats and suggest techniques to help you create efficient yet stunning graphics for your Web documents.

LAB NOTES With this issue's PC reviews, PC Magazine Labs introduces Winstone 32, the new 32-bit benchmark test program developed by the Ziff-Davis Benchmark Operation. It's designed to measure a PC's performance when running the new generations of 32-bit Windows applications.

FEATURES PLUS For our article on Windows 95 Help authoring tools, we reviewed five products. In conjunction with the article, contributing technical editor Neil J. Rubenking leads an online discussion, with representatives from the vendors of Doc-To-Help, ForeHelp 2.1.1, HelpBreeze, ProtoView Visual Help Builder, RoboHelp 95, Help Magician Pro 95, and WYSI-Help.

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Help Authoring Tools

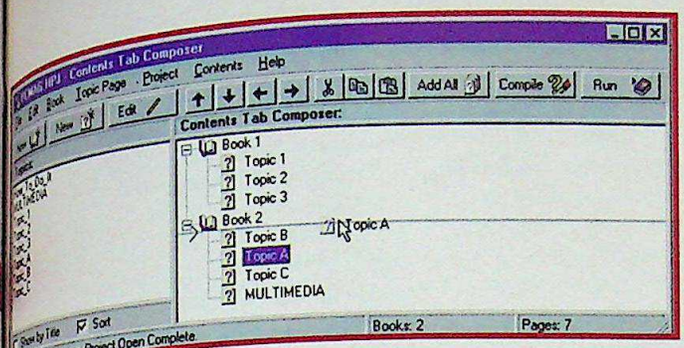


FIGURE 1: A Help system's Contents tab organizes topics into a hierarchy; here, the Contents tab is being organized in RoboHelp 95.

to the familiar keyword search dialog, and the Find tab enables a full-text search of the Help system.

The Contents tab is a tree-structured arrangement of "books" and "topics." Each book holds one or more topics and may also hold other books. Figure 1 shows a Contents tab being modified in RoboHelp 95's Contents Tab Composer. Double-clicking a book opens or closes it, and double-clicking a topic jumps to that topic in the Help system. The Contents page can seamlessly integrate multiple Help files, displaying each one as a book.

The Index page goes beyond the traditional topic-search dialog by permitting two-level keywords, with subkeys that refine the meaning of a main index keyword. For example, the main keyword *mammals* might have the subkeys *primates* and *ungulates*. Of course, the user's ability to find a topic based on keywords depends entirely on the Help-system designer's expertise in specifying logical keywords. When the Index page fails, the Find page permits a full-text search of the Help system. Help designers rarely supply a full-text index along with the Help file, because WinHelp 4 automatically creates the index the first time it's needed.

NEW WINDOW TREATMENTS

The explanatory topic pages we know and love are called *overview topics* in WinHelp 4; they are usually displayed in a main window. Terse, step-by-step instructions that direct the user through a process in the application are *procedural topics*. They appear in a new kind of narrow window placed on the right of the screen (so as not to obscure the application), and they often include shortcut buttons that trigger actions in the program.

The other prominent new window type is the context-sensitive Help panel, or "What's This?" window (Figure 2). In many Windows 95 programs, you can get a brief description of an on-screen element by right-clicking it and choosing "What's This?" from the menu, by selecting it and pressing F1, or by clicking it after clicking the question-mark icon on the title bar.

WinHelp 4 gives the Help designer more freedom to create secondary Help window classes: Procedural topics usually reside in a secondary window, as do other frequent tenants like glossaries and examples. A Help system can have as many as 255 different secondary-window classes, and individual topics can be linked to a specific window style. Secondary windows can now have toolbar buttons as well. The designer can specify the window's relative size and screen location and optionally make it adjust its height to fit the topic.

BUTTONS, MACROS, AND ART

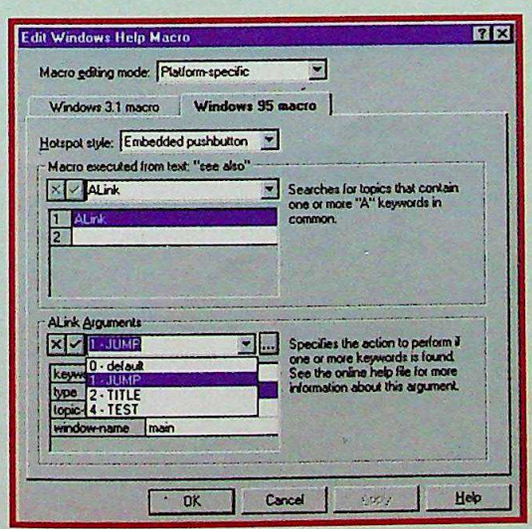
Three new types of buttons escape from the toolbar and appear in the midst of Help text (Figure 3). An *authorable* button looks like an ordinary push button, except that it's shorter from top to bottom and can be used as a hotspot to trigger a jump, pop-up, or macro. A *shortcut* button is a tiny square button with a picture of an arrow, like the familiar shortcuts on your Windows 95 desktop. This type of button usually performs a task for the user. And a *mini* button is a tiny blank square that option-

WEXTECH SYSTEMS INC.

Doc-To-Help

Doc-To-Help, Version 2.0, produces both printed documentation and a Help system from a single source. Doc-To-Help uses the Microsoft Word document's hierarchy of headings to define topics and jumps in the Help file. This is especially beneficial in WinHelp 4, as Doc-To-Help also uses the hierarchy to define the Contents tab. To create our six topics and two books, we simply formatted the book names and topic names with Header 1 and Header 2 styles. A separate browse sequence for each book was created automatically, as Doc-To-Help defaults to starting a new sequence at each Header 1 line.

Doc-To-Help assigns index entries (which become keywords) based on a user-specified list of target phrases and insertion options. A-keywords are not directly supported, but we were able to create them by inserting appropriately formatted footnotes. Secondary windows are associated with topic types; the list of default types can be seen in Figure 2. With a few minor changes, the Procedural type matched our specification.



Doc-To-Help's macro-editing dialog provides on-screen help for macros and their arguments. In some cases, it provides a drop-down list of possible values.

By the time you read this, Doc-To-Help should support mini and shortcut buttons; we substituted authorable buttons for testing purposes. To create each WinHelp 4 macro, we endured a three-step process, confirming our need for platform-specific code. The macro-editing dialog—shown here—proved execellent once we reached it: The dialog provided on-screen help for each macro and its arguments, including, wherever possible, a drop-down list of values. Macro creation went smoothly, as did embedding the .AVI file. Compiling even this eight-topic project into a Help file, however, required a lengthy conversion process. Though it can be used for any Help system, Doc-To-Help is best suited for large projects that follow the same structure as a printed manual.

Doc-To-Help 2.0. List price: $395. Requires: 8MB RAM (16MB recommended), 10MB hard disk space, Microsoft Word 7.0. WexTech Systems Inc., New York, NY; http://www.wextech.com. *(No Indian partner.)*

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ally has text beside it. "See also" lists of related topics are often invoked from mini buttons.

WinHelp 4 defines over 30 new macros. Many of these simply enhance existing macros, but some add exciting new capabilities. Table 1 lists 12 of the most interesting additions.

The KLink macro displays a list of topics that share one or more specified keywords. The ALink macro does the same thing, but it uses A-keywords—a new type of hidden keyword that does not appear in the index. Both are normally used for the automatic display of related topics. Due to a bug in WinHelp 4, an ALink or KLink macro that uses multiple keywords will list a topic once for *each* matching keyword, appending the Help filename to the repeated references. Thus, it's best to use these macros with a single keyword.

Calling the InitMPrint macro displays the Printer Setup dialog and prepares WinHelp 4 for printing multiple topics (another new feature). MPrintID prints an individual topic, and EndMPrint terminates the process of printing multiple topics.

A Help system can invoke the Find tab of the Help Topics dialog by calling the Find macro; the existing Contents and Search macros invoke the dialog's Contents and Index tabs. The Finder macro brings up the Help Topics dialog with whatever tab was previously active. And you can trigger WinHelp 4's right-click context menu by calling the Menu macro.

The remaining macros in the dynamite dozen all involve actions outside of WinHelp. ExecFile replaces the old ExecProgram macro. It executes a program or a document associated with a program, and it can trigger an error message topic within the help system if it fails. ShellExecute *should* do the same, plus add the option to control the working directory and choose whether to open the file or to print it. Unfortunately, a bug in ShellExecute's implementation causes it to fail if these added abilities are used.

If you've used the Troubleshooting topics in Windows 95's own Help, you've seen the ControlPanel macro in action. This macro invokes a control panel applet and opens it to a particular tab. There is one catch: The three parameters to ControlPanel are officially listed as the .CPL file name, the applet name, and the zero-based tab number. In practice, the tab number, preceded by a comma, must be appended to the applet name. So, for example,

```
ControlPanel("desk.cpl", "Display", 1)
```

is officially correct, but

```
ControlPanel("desk.cpl", "Display,1")
```

is what actually works.

The Shortcut macro has even more power—it will activate or launch a specific program (usually the application described

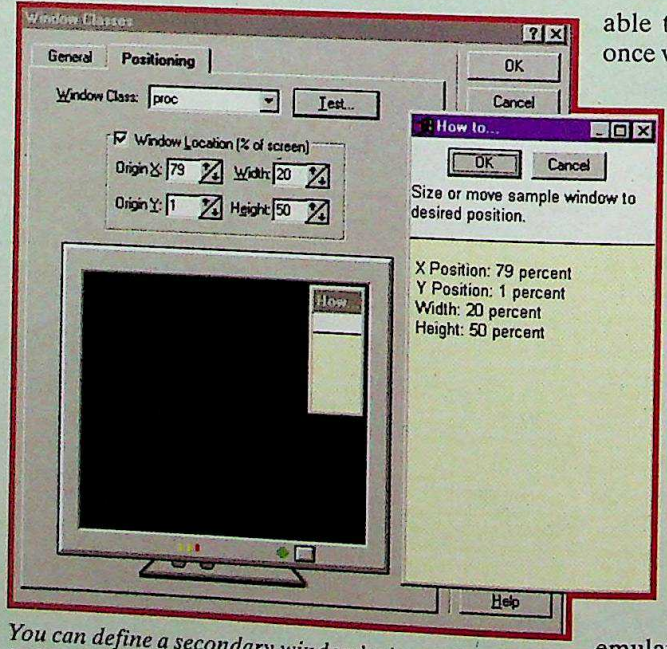
A SELECTION OF WINHELP 4'S NEW MACROS

Macro	Effect
KLink	Finds topics related via K (normal) keywords.
ALink	Finds topics related via A (hidden) keywords.
InitMPrint	Initializes multiple-topic printing.
MPrintID	Prints a topic.
EndMPrint	Terminates multiple-topic printing.
Find	Displays the Find tab in the Help Topics dialog.
Finder	Displays the Help Topics dialog.
Menu	Displays the right-click context menu.
ExecFile	Launches a program or document file.
ShellExecute	Opens or prints the specified file.
ControlPanel	Launches a control-panel applet; opens it to a specific tab.
ShortCut	Activates a program and sends it a WM_COMMAND message.

FOREFRONT INC.

ForeHelp

ForeHelp 2.95's design window is as similar to WinHelp's own screen as can be (Figure 3). Creating our six topics was a snap, and they all *looked* like Help topics right away. The Topic Keywords dialog allowed us to set the two-level keywords and the invisible A-keywords all at once. The Browse Sequence editor uses a clear drag-and-drop interface, and topics are grayed once they've been added to a sequence. The Browse Sequence editor even includes a button to add all unused topics to the current sequence. The Contents File editor has a similar interface, though it provides no easy way to determine whether a given topic has been added to the Contents File yet.



You can define a secondary window's size and position in ForeHelp using either the pictured screen in the Window Classes dialog or the screen itself.

You can easily create secondary window classes, and, as you can see, you can adjust the screen-relative size of a secondary window using a real window on the full screen. We were able to add all three types of buttons once we realized that ForeHelp refers to the shortcut button as a type of bullet. The macro editor tracks separate macro parameters, but macro help and parameter definitions aren't built into it. We found the "macro set" feature handy: Define an existing series of macro commands as a set, and you can reuse that set elsewhere in your Help system.

ForeHelp is an excellent tool for the visually-oriented designer. Buttons, .AVI files, and just about all Help-system features appear at design time, and most of them are functional in the extremely fast test mode. As long as you don't want to *play* .AVI files or run advanced macros, test mode emulates WinHelp quite well, without the need to compile and run the project.

ForeHelp 2.95. List price: $395. Requires 4MB RAM (8MB recommended), 6MB hard disk space. ForeFront Inc., Boulder, CO. *(No Indian partner.)*

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...Help file) and send it a menu command. ...figuring out the ID number for a menu command in a program you didn't write can be difficult, but one of the design tools handles even ...this task for you.

You could use 256-color graphics in the ...previous version of WinHelp, but it took ...time work. WinHelp 4 permits bitmaps in ...256-color or in 24-bit color. Similarly, adding ...video and sound files had been possible but ...tedious; now, it's automatic. For nonrectangu... ...bitmaps, bitmaps can define a "transpar... ...nt" color to let the background show ...through. And the Help compiler itself in... ...cludes a dozen or so small, default bitmaps.

THE TOOLS

It's possible to create a Help system by embedding special codes in a Rich Text Format (.RTF) document, then compiling it with Microsoft's Help Compiler. It's also possible to dig a hole in a slab of granite using a rusty spoon. Luckily, tools for the Help-system designer abound. We looked at five that support WinHelp 4. They fall into two groups: those that rely on Microsoft Word, and those that stand alone. Doc-To-Help, RoboHelp 95, and HelpBreeze all use Word to generate the .RTF file that defines a Help system. These tools integrate their commands into Word's menu and add toolbars for Help-specific actions. Help Magician Pro (currently in beta testing) and ForeHelp are independent; you don't have to buy Microsoft Word. The aim of these packages is to make the Help design environment look as much like the final Help system as possible.

All of the products examined here can create Windows 3.*x* Help systems, but to generate WinHelp 4 Help systems, they require either Windows 95 or Windows NT 3.51 or later. Those products that rely on Word require Version 7.0; RoboHelp can optionally use the 32-bit Windows NT version of Word 6.0.

To test the suitability of these tools for designing WinHelp 4 Help systems, we devised a simple set of tasks using features specific to WinHelp 4:

- Create six Help topics, each with two-level keywords.
- Put two books on the Contents page and add three of the topics to each one.
- Create two browse sequences corresponding to the two books.
- Add the hidden A-keyword *Odd* to the first, third, and fifth topics.
- Define a secondary-window class for procedural topics with a pale-yellow background and the toolbar buttons Help Topics and Options. This window must adjust to the height of the topic and appear at the right

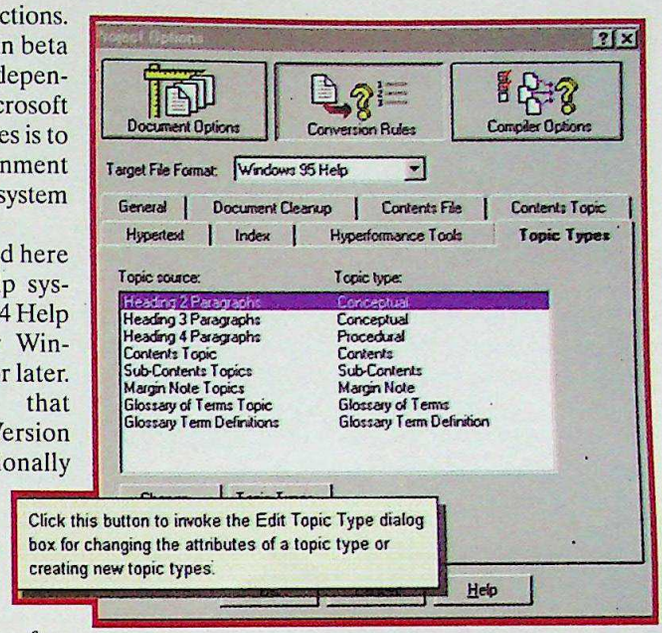


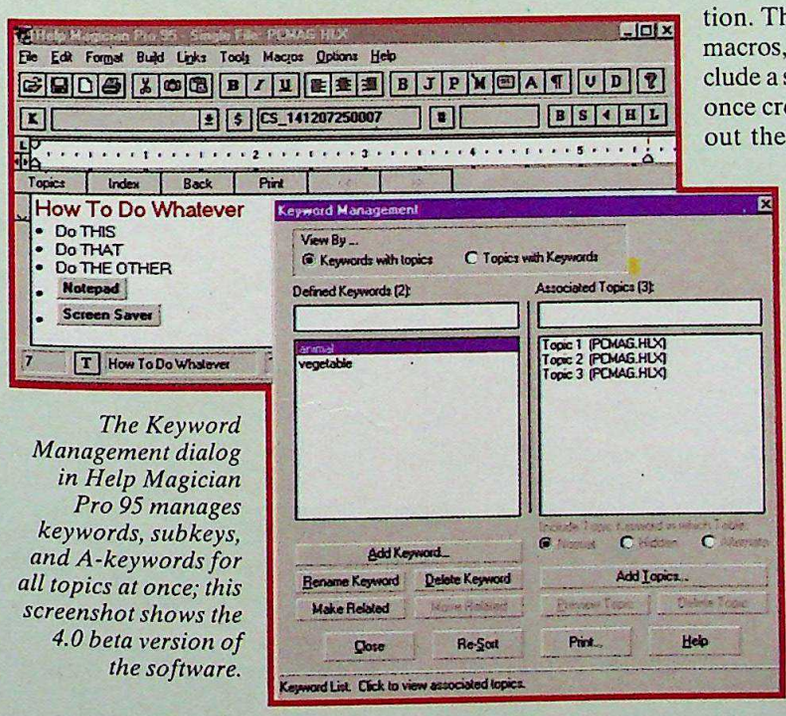
FIGURE 2: *Many Windows 95 applications offer "What's This?" floating help panels like this one.*

SOFTWARE INTERPHASE INC.

Help Magician Pro 95

Help Magician Pro 95 (currently in a 4.0 beta version) is, like ForeHelp, a standalone, WYSIWYG Help design tool. In the beta version we examined, most of the WinHelp 4 enhancements were implemented. As you can see, the Keyword Management feature conveniently allowed us to assign keywords to several topics at once (although two-level keywords and A-keywords were not enabled in the beta version). Also like ForeHelp, Help Magician permits setting secondary window size and position using an actual window on the full screen.

The finished product will support mini and shortcut buttons; we substituted author... buttons for testing purposes. Selecting a keyword as the jump destination automatically inserts an ALink or KLink macro. Before you use a WinHelp macro in Help Magician, you must create a macro definition. This seems awkward for single macros, but a macro definition can include a series of WinHelp macros, and once created, it can be used throughout the Help system. Our Notepad and Screen Saver macros were successful, but attempts to add an .AVI file crashed the beta software. The finished product, scheduled for release in May, will please those who want a WYSIWYG Help design tool; it will also support the creation of Web pages directly from Help-system source code. And if you're new to Help designer, the Help Wizard will lead you through the process one simple step at a time.



The Keyword Management dialog in Help Magician Pro 95 manages keywords, subkeys, and A-keywords for all topics at once; this screenshot shows the 4.0 beta version of the software.

Help Magician Pro 95 (4.0 beta). List price: $249. Requires: 8MB RAM, 10MB hard disk space. Software Interphase Inc., Foster, RI; http://www.sinterphase.com.
(No Indian partner.)

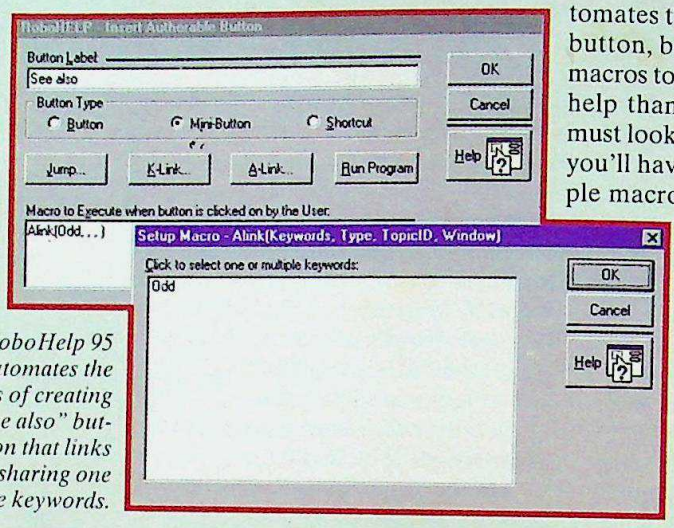
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BLUE SKY SOFTWARE CORP.

RoboHelp 95

Blue Sky Software updated RoboHelp 95 for WinHelp 4 even before the Windows 95 launch. Although RoboHelp relies on Microsoft Word, its floating toolbar and numerous dialog boxes emphasize that RoboHelp is in charge. The current version, Revision A, adds the ability to create Windows 3.*x* Help systems.



RoboHelp 95 automates the process of creating a "see also" button that links topics sharing one or more keywords.

We created our six topics and entered the two-level keywords and A-keywords, all in the Help-topic-creation dialog. Using the drag-and-drop Contents Tab Composer (shown in Figure 1), we easily created two books and added three topics to each. On the other hand, setting up a second browse sequence was surprisingly difficult, requiring us to edit each topic in the second sequence.

As the screenshot here illustrates, the button-editor dialog automates the process of creating a "see also" button, but when you're adding a series of macros to a button, RoboHelp gives you less help than any of the other products. You must look up the necessary parameters, and you'll have to remember to separate multiple macros with colons or semicolons, depending on how the macro is to be invoked. .AVI file insertion went smoothly, and when we deliberately introduced an error, RoboHelp's error wizard explained the problem in detail. Alone or as a part of Blue Sky's WinHelp Office suite, RoboHelp is a thoroughly professional product that represents years of development.

RoboHelp 95, Revision A. List price: $499. WinHelp Office: Introductory price, $599; $866 thereafter. Requires: 8MB RAM, 8MB hard disk space, Microsoft Word 7.0. Blue Sky Software Corp., La Jolla, CA; http://www. blue-sky.com.
(No Indian part ner.)

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Help Authoring Tools

side of the screen.
- Create a procedural topic that uses the secondary window defined in the previous step.
- Add a "see also" mini button to the first, third, and fifth topics; each button should trigger an ALink macro on the keyword *Odd*.
- Create a shortcut button that uses the Shortcut macro to open Notepad, insert the current date and time, select the text and copy it to the clipboard.
- Add an authorable button that opens the Screen Saver page of the Display control panel applet.
- Add a topic that plays a video file when opened.

Each of the shipping products handled these tasks with reasonable success. Precisely which is best for *you* will depend on other considerations. If your primary goal is to create a full-scale product manual and Help system from the same source, Doc-To-Help is clearly the best choice. If you don't have Word 7.0, or if you prefer a WYSIWYG editing environment, you should choose ForeHelp (or, when it's released, Help Magician Pro 95). Word 7.0 users who aren't concerned with producing product manuals will choose between RoboHelp 95 and HelpBreeze. RoboHelp is a well-established product with an excellent track record and years of refinement. The less-known HelpBreeze, however, thoroughly integrates the WinHelp 4 features and costs a good bit less.

COMING ATTRACTIONS

Two other Windows 95 Help authoring tools will ship in the near future: Visual Help Builder 3.0, from ProtoView will support all of the WinHelp 4 enhancements. In addition, it will have the unusual ability to scan an application's source code and generate an appropriate Help-system skeleton. The Windows 95 version of WYSI-Help, from UDI Software should be available by the time you read this. And, of course, Help Magician Pro 95 will be shipping soon.

WinHelp 4 itself has quite a few bugs, some of which are noted in this article. It will undergo a minor update in conjunction with the release of Windows NT 4.0, but that will be the last version of WinHelp as we know it. At a recent WinHelp conference, Microsoft revealed that the next incarnation of WinHelp will be based on HTML files (the files used to describe Web pages) rather than .RTF files. This time next year, it may be a whole new ball game. □

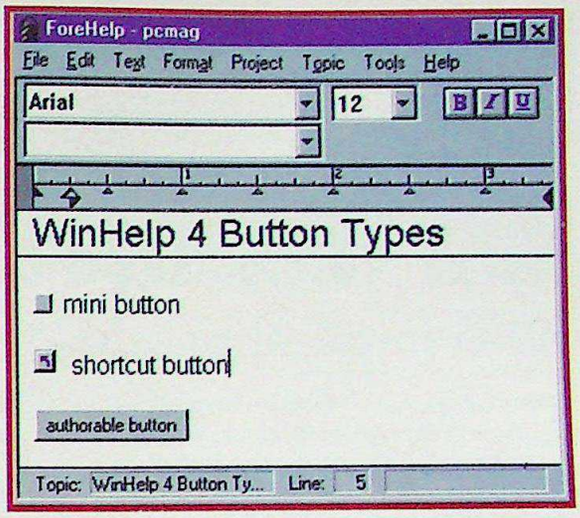


FIGURE 3: *WinHelp 4 introduces three new types of in-text buttons; here, all three are displayed in ForeHelp.*

Neil J. Rubenking is the contributing technical editor of PC Magazine.

SOLUTIONSOFT

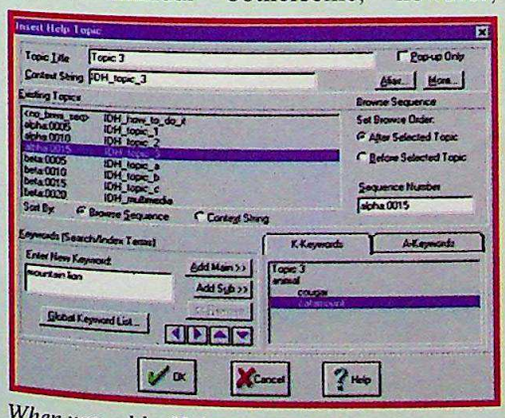
HelpBreeze

HelpBreeze, Version 2.0, adds dozens of menu choices and a substantial toolbar to Microsoft Word, and thoroughly integrates the WinHelp 4 enhancements. We created our six topics and added two-level keywords and A-keywords from the Insert Help Topic dialog (shown below). The Contents file editor was straightforward, although implemented without drag-and-drop. By the time you read this, a manual for HelpBreeze will be available. We didn't find the lack of a manual bothersome, however; we used HelpBreeze's Help system instead.

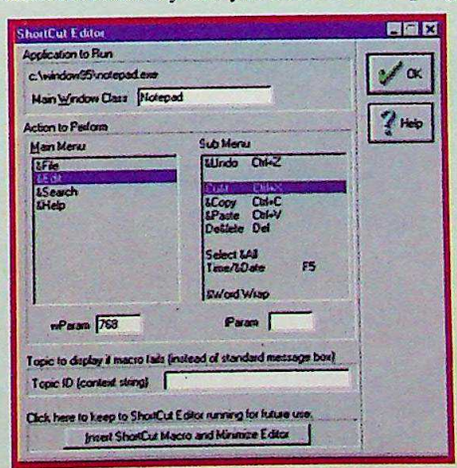
A built-in topic wizard created our secondary window and procedural topic; for fine-tuning the window's properties, the wizard launched the Microsoft Help Workshop. HelpBreeze automates the process of linking to topics related via keywords; we didn't explicity need to create an ALink macro for our "see also" button.

HelpBreeze's distributable WebDialer utility implements links from a Help system to the Internet. To add a Web link, you simply connect to the site, create a macro hotspot, and press the URL button. The resulting macro will connect to that URL using WebDialer.

We were amazed by the macro editor's handling of the Shortcut macro. It actually analyzed the selected program and, as the screenshot shows, allowed us to choose which menu item to trigger. You'll receive no assistance at all for building arguments to the other macros, however; you simply read the Help topic for the macro in question and type in the parameters. Our ControlPanel macro worked fine, as did the embedded .AVI file. If you're happy working in Microsoft Word and want to emphasize the WinHelp 4 enhancements in your projects, HelpBreeze is a fine choice.



When you add a Help topic in HelpBreeze, you can set the browse sequence and all of its keywords at the same time.



This remarkable dialog from HelpBreeze analyzes and displays the menu structure of a selected program, then generates a Shortcut macro to execute the selected menu item.

HelpBreeze 2.0. List price: $349. Requires: 4MB RAM, 6.5MB hard disk space, Microsoft Word 7.0. Solutionsoft, Sunnyvale, CA; http://www.solutionsoft.com.
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PC Tech/Tutor

By Jeff Prosise

How Windows 95 Stores Long Filenames

What implications do long filenames pose for end users?

For years, DOS and Windows users have been hampered by filenames limited to eight characters plus a three-character extension. The Macintosh OS, OS/2, and Windows NT have supported long filenames for what seems like forever, but it wasn't until the debut of Windows 95 last year that mainstream Windows users finally were able to bid the 8.3 filename format good-bye.

Much has been written about the ability of Windows 95's VFAT (Virtual File Allocation Table) file system to use long filenames, but do you know how those long filenames are implemented? The on-disk storage format of 8.3 filenames is well-documented, but there has been surprisingly little information published about the internals of long filenames. That's a shame, because the need to make VFAT backward-compatible with the FAT file system forced some design compromises that have very real implications for end users. For example, did you know that there are drawbacks to using long filenames in a drive's root directory? And that if you don't defragment a drive that contains long filenames every now and then, perfectly good disk space can go unused?

To understand why, it helps to know how long filenames are implemented in Windows 95. Let's begin by looking at how the operating system stores long filenames on disk.

THE 8.3 DIRECTORY ENTRY FORMAT

Windows 95 stores short (8.3) filenames the same way DOS and 16-bit versions of Windows do. Every file on every disk is accompanied by a 32-byte *directory entry* that records the name of the file as well as the file's attributes (hidden, system, read-only, and so on), a date and time stamp, and other information. When you type DIR at a command prompt to list the contents of a directory, what you see in response is a human-readable version of the information stored in that directory's directory entries.

Figure 1 documents the format of the 8.3 directory entry. The eight-character filename and three-character extension occupy the first 11 bytes. These fields contain 8-bit ASCII character codes. Names shorter than eight characters in length and extensions shorter than three are padded with space characters (ASCII 32). The next byte holds a series of bit flags specifying the file attributes. The last 10 bytes of the directory entry store values indicating the time and date the file was created or last modified, the file's starting cluster number, and the file's length in bytes. The starting cluster number is a 16-bit value that identifies the first cluster containing the file's data.

Before a file is read or written, the operating system consults the file's directory entry to find the starting cluster number. If the file occupies more than one cluster of disk space, values identifying the remaining clusters are retrieved from an on-disk data structure called the *file allocation table*, or FAT. Information from this table is cached in memory, and the FAT and VFAT file systems derive their filenames.

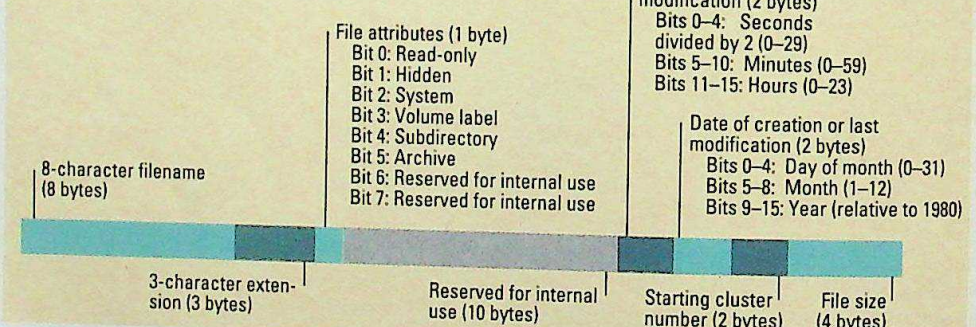


FIGURE 1: *Short filenames are stored on disk in the 32-byte format.*

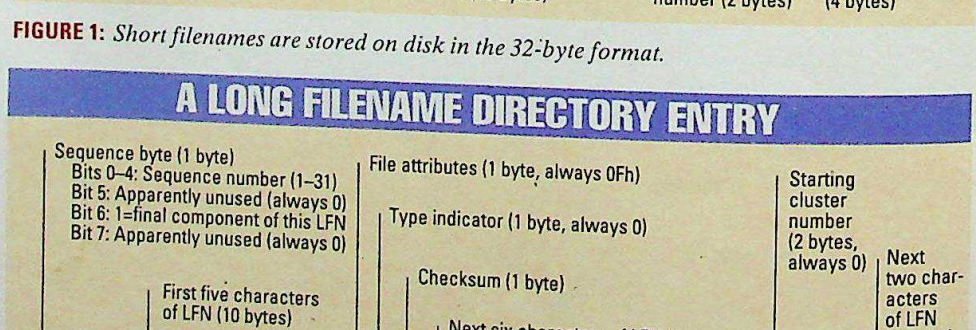


FIGURE 2: *Long filenames are stored in the above format in one or more 32-byte LFN directory entries that precede short filename directory entries. The characters comprising the filename are Unicode characters requiring 2 bytes each.*

Directory entries for files in the root directory are stored in a special area of the disk that is set aside to hold information about the root directory. Directory entries for files located in subdirectories are stored in special files with their own directory entries. The attribute bytes have bit 4 set to identify them as subdirectories. The size of the area reserved for root directory entries is fixed when the disk is formatted and can't be changed without special software. That's why the number of files and subdirectories you can create in the root directory is always limited to some fixed number (512 for most hard disks). Subdirectories, however, can grow just like files, so the number of files and subdirectories a subdirectory can hold is limited only by available disk space.

LFN DIRECTORY ENTRIES

Because of compatibility issues, adding long filename support to an operating system that uses 8.3 filenames isn't as simple as expanding

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directory entries to hold more than 11 characters. If a new operating system used a new directory entry format, you wouldn't be able to copy a file to a floppy disk with the new system and then read it with the old one. Another problem is that if this new operating system returned 255-character filenames, many older applications, which expect to receive no more than 11 characters, would crash. Why? Because a program has to set aside memory to store the filenames it reads, and if it sets aside 16 bytes for a filename and the operating system copies, say, 32 characters into that space, then other data gets overwritten. Any programmer can tell you that the surest way to break an application is to copy random data into its data space.

Windows 95's designers devised a clever solution to the problem of supporting long filenames while preserving compatibility with previous versions of DOS and Windows applications. When most applications (except for low-level disk utilities such as the Norton Disk Doctor) query the system for file and subdirectory names, they do so not by reading directory entries directly off the disk, but by using enumeration functions built into the operating system. Through testing, Microsoft found that if a directory entry is marked with an "impossible" combination of read-only, hidden, system, and volume label attribute bits—that is, if the directory entry's attribute byte holds the value 0Fh—the enumeration functions built into all existing versions of DOS and all pre-95 versions of Windows will skip over that directory entry as if it weren't there. The solution for Windows 95, then, was to store two names for every file and subdirectory: a short name that's visible to all applications and a long name that's visible only to Windows 95 applications and to applications that have been rewritten to add support for long filenames. Short filenames are stored in 8.3 format in conventional 32-byte directory entries. Windows creates a short filename from a long one by truncating it to six uppercase characters and adding "~1" to the end of the base filename. If there's already another filename with the same first six characters, the number is incremented. The extension is kept the same, and any character that was illegal in earlier versions of Windows and DOS is replaced with an underscore.

Long filenames are stored in specially formatted 32-byte long filename (LFN) directory entries marked with attribute bytes set to 0Fh. For a given file or subdirectory, a group of one or more LFN directory entries immediately precedes the single 8.3 directory entry on the disk. Each LFN directory entry contains up to 13 characters of the long filename, and the operating system strings together as many as needed to comprise an entire long filename.

Think about what this means. If a file with a long filename is copied to a floppy disk and that floppy disk is inserted in a PC running DOS or Windows 3.*x*, only the short filename is visible to the operating system, which ignores the LFN directory entries. And because only the short filename is visible, an application that requests a file or subdirectory name from the operating system won't get surprised with a longer-than-expected name. Pretty slick.

Under Windows 95, 16-bit DOS and Windows applications still see only short filenames, because the operating system answers requests for file and subdirectory names with 8.3 names unless applications call special enumeration functions that are LFN-compatible. All 32-bit Windows applications call LFN enumeration functions by default, so they get access to long filenames right out of the box.

Figure 2 shows the format of the LFN directory entry. Filenames are stored in Unicode format, which requires 2 bytes per character as opposed to ASCII's 1 byte. Filename characters are spread among three separate fields: the first 10 bytes (five characters) in length, the second 12 bytes (six characters), and the third 4 bytes (two characters). The lowest five bits of the directory entry's first byte hold a *sequence number* that identifies the directory entry's position relative to other LFN directory entries associated with the same file. If a long filename requires three LFN directory entries, for example, the sequence number of the first will be 1, that of the second will be 2, and the sequence number of the third will be 3. Bit 6 of the third entry's first byte is set to 1 to indicate that it's the last entry in the sequence.

```
41 42  00 75  00  64  00  67-00 65 00 0F 00 D8 74  00  AB.u.d.g.e....t.
2E  00 78  00  6C 00  73  00-00 00 00 00 FF  FF  FF  FF  ..x.l.s.........
42 55   44 47 45   54   20 20-58 4C 53  20 00 96 34 87   BUDGET  XLS ..4.
70 20  70 20  00  00  54  48-70 20 C9  03  A9  1D 00 00  p p ..THp ......
```

FIGURE 3: *This is a hex dump of the directory entires for a file named Budget.xls.*

```
43 36 00 2E 00 78 00 6C-00 73 00 0F 00 E0 00 00  C6..x.l.s.....
FF FF FF FF FF FF FF FF-FF FF 00 00 FF FF FF FF  ................
02 73 00 63 00 61 00 6C-00 2000 0F 00 E0 59 00   .s.c.a.l. ....Y.
65 00 61 00 72 00 20 00-31 00 00 00 39 00 39 00  e.a.r. .1...9.9.
01 42 00 75 00 64 00 67-00 65 00 0F 00 E0 74 00  .B.u.d.g.e....t.
20 00 66 00 6F 00 72 00-20 00 00 00 46 00 69 00  .f.o.r. ...F.i.
42 55 44 47 45 54 7E 31-58 4C 53 20 00 4A CF 88   BUDGET~1XLS .J..
70 20 70 20 00 00 54  48-70 20 C9  03  A9  1D 00 00  p p ..THp ......
```

FIGURE 4: *This is a hex dump of the directory entries for a file named "Budget for Fiscal Year 1996.xls."*

The attribute field appears at the same location in LFN directory entries as in 8.3 directory entries. It has to, because the file system doesn't know which type of directory entry it's dealing with until after it examines the attribute byte. The starting cluster number field also appears at the same location, but in LFN directory entries its value is always 0. The type indicator field also holds 0 in every long filename I've examined, but Adrian King's *Inside Windows 95* (Microsoft Press, 1994) says it can also hold a nonzero value indicating that the directory entry contains "class information" for the corresponding file. (Unfortunately, the book doesn't say what class information is, so one can only guess what Microsoft had in mind there.) The LFN directory entry's checksum byte holds an eight-bit checksum value computed by adding certain fields of the 8.3 directory entry and performing a modulo 256 operation on the result. Windows 95 uses this checksum to detect orphaned or corrupted LFN directory entries.

An LFN directory entry is created even if a long filename is short enough to fit the 8.3 format, because long filenames preserve case and short filenames do not. Figure 3 shows a hex dump of the directory entries for a file named Budget.xls. The short name (BUDGET.XLS) is stored in the 8.3 directory entry. Immediately preceding that entry is an LFN directory entry containing the filename Budget.xls. The LFN directory entry's sequence number is 1, with bit 6 set to 1 to show it's the last entry as well as the first. Because LFN directory entries always come right before the corresponding 8.3 directory entries, Windows 95 can easily locate a long filename once it has found the 8.3 directory entry for a specified file or subdirectory.

Figure 4 illustrates what the short and long filename directory entries would look like if our file were named "Budget for Fiscal Year 1996.xls" instead of Budget.xls. Because the long filename now contains 31 characters, three LFN directory entries are required. Note the reverse order of the LFN directory entries: The first 13 characters of the long filename are stored in the LFN directory entry preceding the short filename, the next 13 in the entry before that, and the final five in the entry before that.

THE DARK SIDE OF LFNs

On the surface, VFAT's method of supporting long filenames while preserving compatibility with legacy applications seems an ideal solu-

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tion. And in many ways it is. But VFAT's LFN support is still far from perfect. Here's why.

One of the problems with long filenames is that they consume more disk space than short ones. That's not a big deal when long names are stored in subdirectories, because as long as disk space is available, subdirectories can grow to accommodate added directory entries. But the maximum number of directory entries available in the root directory is fixed, and long filenames eat up space in the root directory as if there's no tomorrow. The root directories of most hard disks contain at most 512 directory entries. Because a 128-character name requires 11 entries (ten for the long name and one for the short name), you could create only 46 files and subdirectories in the root directory if each were given a 128-character name. Using long filenames in the root

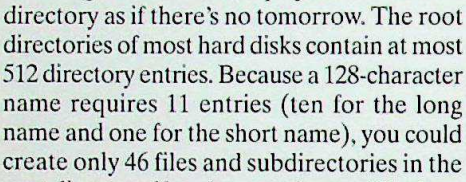


FIGURE 5: *ScanDisk detects orphaned LFN directory entries and gives you a chance to delete them using the dialog box shown here.*

directories of drives formatted with more advanced file systems such as OS/2's HPFS and Windows NT's NTFS isn't a problem, because the sizes of their root directories aren't fixed.

A more serious problem arises when LFN directory entries become orphaned. Let's say you copy a file with a long filename to a floppy disk and give the disk to someone who runs DOS or Windows 3.1. If that person deletes or renames the file, the 8.3 directory entry gets deleted or renamed, but the LFN directory entries get left behind, because neither DOS nor Windows 3.1 knows anything about LFN directory entries. The LFN directory entries are said to be "orphaned." (Of course, you could orphan LFN directory entries on your hard disk, too, if you booted from a DOS floppy and proceeded to delete or rename files on your hard disk.)

Windows 95 recognizes that an orphaned directory entry is invalid, because its checksum no longer matches the 8.3 directory entry that follows it. But as far as I can tell, orphaned entries never go away. Unless you run ScanDisk on the disk, they just sit there, tying up disk space. ScanDisk detects orphaned LFN directory entries and asks you if you'd like them deleted (see Figure 5).

What about 16-bit applications running under Windows 95? Is it safe for them to delete or rename files? To its credit, Windows 95 recognizes when a legacy application that isn't LFN-enabled deletes or renames a file. In both cases, it deletes the LFN directory entries to prevent them from being orphaned; thus, if a legacy application renames a file (using its short name), the long filename is lost. For this reason, it's a good idea to stay away from long filenames if you still use your favorite DOS or Windows 3.1 application to do file and directory management.

Even if you use nothing but 32-bit applications, there are still instances in which long filenames can use disk space inefficiently. As files are created and deleted within a directory, directory entries become "fragmented," in the sense that discarded entries become scattered among the valid ones. Since the LFN and 8.3 directory entries for a given file or subdirectory must reside in contiguous entries, it's possible for a directory to be mostly empty yet still not have room to store a new long filename. This is because there aren't enough contiguous free directory entries. So if the largest group of consecutive empty directory entries is three entries in size and you create a file whose name requires four, then either the creation will fail (if the file is being created in the root directory) or the system will allocate more disk space for four new directory entries (if the file is being added to a subdirectory).

Either way, disk space is wasted, because empty entries are unused. Worse, if a lone empty directory entry becomes trapped between used ones, the only way that entry will ever be used (assuming you don't delete the ones surrounding it) is if a legacy application creates a file or subdirectory that happens to use that particular directory entry (a file or subdirectory created by a legacy application requires only one directory entry, because the system does not create a long filename to go with it).

The only solution to this problem that I've found is to defragment the disk. Windows 95's Defrag utility packs directory entries together so that unused entries are consolidated into a pool. It's always a good idea to defragment your drives periodically, but it's even more important to do it regularly if you use long filenames.

FOREWARNED IS FOREARMED

Now that you understand how long filenames are implemented in Windows 95, you should find it easier to avoid the trouble spots. In general, you'll get the most out of long filenames if you primarily use 32-bit applications, run Defrag and ScanDisk regularly, and avoid the unnecessary use of long names in the root directory.

VFAT's long filename support may not be perfect, but it's still a huge improvement over the 8.3 filenames we were stuck with before. □

Jeff Prosise is a contributing editor of PC Magazine.

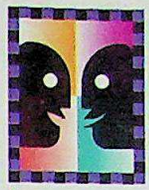
While we offer you the best, we can do still better, if you send us your comments on the magazine.

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By Luisa Simone

Creating Graphic Images for the Web

Whether .GIF or JPEG, it's all about pixels, color, and compression.

Even if you're a beginning World Wide Web publisher, you are sure to discover lots of good reasons to include various kinds of images in your online documents. On the most basic level, pictures give your Web pages more visual appeal. As you compete for readers' attention, images are often a good way to entice and encourage visits to your Web site.

Pictures can also serve an informational purpose. Remember that it is the *World Wide* Web. Diagrams, photographs, maps, and picture icons can help convey your message to international Web surfers who may not be fluent in English. Graphics can also serve as navigational links by including hot spots that, when clicked, function exactly like hypertext links moving a reader to another page within the current document, to another document on your Web site, or to another location altogether on the WWW.

You can even use pictures of text to overcome design limitations of Web publishing, specifically HTML codes. Desktop publishing formatting instructions control the appearance of text, but HTML (HyperText Markup Language) controls only the structure of a document. You can designate the hierarchical relationship between elements by designating which text string is a first-level headline and which paragraphs are body copy, but you can't specify typeface or point size. In fact, text formatting (such as typeface and point size) is controlled by the reader's browser program. As the publisher, you can guarantee that a particular type style will appear on your Web pages only by generating a picture of the text and inserting it into your HTML documents as a graphic.

All of the aforementioned uses require you to import pictures into your HTML documents as inline elements. Inline graphics appear within the main browser window and are embedded in the text flow. Currently, inline graphics are restricted to two file formats: the CompuServe Graphics Interchange Format (.GIF) and the Joint Photographics Expert Group format (JPEG).

Pictures in a wide range of graphics file formats also can be stored externally on your Web server. External graphics can be downloaded for off-line viewing or viewed online in a separate window with the assistance of a helper (or MIME) application.

.GIF AND JPEG: SIMILARITIES

There are both historical and technical differences between the .GIF and JPEG file formats. Before exploring the differences, however, you should consider the similarities of these two standards. Both .GIF and JPEG are raster (also called bitmapped or paint) formats. They can represent a broad variety of image types, including drawings, pictures of text, paintings, and photographs. Both the .GIF and JPEG formats are cross-platform formats, which means that they can be viewed on PCs, Macs, or Unix systems. Finally, both formats are built around a compression scheme that can greatly reduce file size.

The last point is no trivial matter. Because they typically store color information about each pixel in a picture, raster images can grow quite large. Large graphics files can take a long time to download, especially if your readers are using slow dial-up lines and 14.4-Kbps modems. Your objective as a Web publisher will be to produce the smallest, most efficient graphics files without compromising image quality.

In general, you can use three techniques to reduce file size: Reduce the number of pixels in an image, reduce the number of colors in the image, and employ a compression scheme.

SIZING PICTURES APPROPRIATELY

When you publish on the Web, your output medium is not paper, but a monitor. Moni-

FIGURE 1: *Reducing the number of colors in a picture can greatly reduce file size. But notice the enlargements, which show how image quality can be compromised as the number of colors drops.*



Bits per pixel: 24
Number of colors: 16.7 million potential colors
File size: 95K



Bits per pixel: 8
Number of colors: 256
File size: 23K



Bits per pixel: 5
Number of colors: 32
File size: 13K

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tors are basically low-resolution devices, so you should produce small, low-resolution images. Measuring your pictures in pixels will help, because that is how the resolution of a monitor is measured. For example, a 200- by 200-pixel image will occupy nearly one-sixth of an average 640-by-480 VGA monitor. That's quite a lot of real estate to give up to a single picture. Although it won't work for every picture, try to create pictures that measure between 80 and 150 pixels vertically and horizontally. Iconic images destined to become clickable buttons should be even smaller.

When pictures get this small, you'll have to make some compromises concerning the content. Don't expect to reproduce small details, fine line drawings, or small objects photographed from great distances. Instead choose tightly cropped images with bold lines, bright colors, and solid (or evenly gradated) backgrounds, to keep objects recognizable even at tiny sizes (for an example, see Figure 1, which reproduces an antique toy car from MetaTools' Power Photos III clip-art collection).

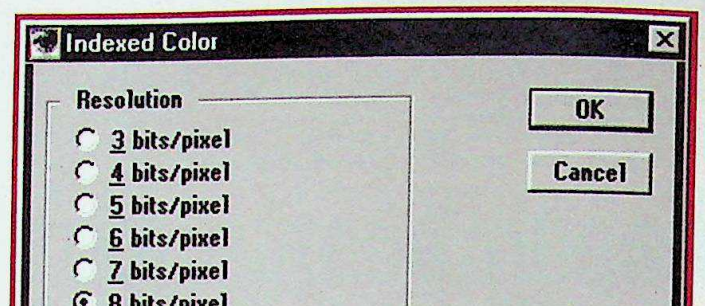


FIGURE 2: *The Index Color options in Adobe Photoshop allow you to determine the number of colors, the type of palette, and the pattern of pixels in the target image.*

REDUCING THE NUMBER OF COLORS

In a perfect computer world, all graphics files would be in glorious 24-bit color. But in the real world, you can greatly reduce file size (and conserve resources) by squeezing the full 16.7 million potential colors into 256 or fewer colors. Choosing to reduce the number of colors in a picture is in effect a decision to use the .GIF format. That's because .GIF supports a maximum of 256 colors, which are stored in a directory called, variously, the color palette, the color lookup table, or the color index.

Compare the three versions of the same picture in Figure 1. This series clearly demonstrates the advantages of color reduction. By dropping the image from 24 bits per pixel to only 8 bits per pixel, you reduce the file size by three-quarters. Dropping the amount of data per pixel even further, to 5 bits, produces a file with only 32 colors at a size of only 13K.

If you look at the enlargements directly below each image, however, you'll see that fewer colors can translate into poorer image quality. Whenever you reduce a 24-bit full-color picture to 8-bit indexed color, you must choose conversion options carefully, in order to produce the closest possible match to the original image. Figure 2, which shows the Index Color options dialog box in Adobe Photoshop, outlines the three parameters that ultimately determine both the size of the file and the quality of the picture.

Resolution here refers to color resolution or bit depth. The number of data bits per pixel yields the number of colors that will appear in the palette and subsequently in the picture. A depth of eight, for example, produces a 256-color palette. To compute the number of colors in a given palette, use the number of bits per pixel as the exponent for the number 2, where 2 represents the two states (on and off) for each bit. Thus, a resolution of four bits per pixel will produce a 16-color palette (2^4 or 2 x 2 x 2 x 2).

If you want the best shot at matching the colors in the original image, choose the palette type carefully. System or uniform palettes use predetermined colors that often bear little relationship to the colors in your picture. The best choice is usually the adaptive or optimized palette, which is based on a histogram that evaluates of the most frequently occurring colors in a picture.

One major word of warning about optimized or adaptive palettes. This setting creates a unique palette for each image. If, however, your HTML document contains multiple images and each has a unique palette, you (or your readers) will encounter palette conflicts. Palette conflicts are common to Windows applications when indexed color images are displayed sequentially. They are especially common on older systems equipped with slow graphics adapters. Basically, Windows always loads the palette *before* it loads an indexed color image. So if you already have an image that uses a different palette on screen when the new palette is loaded, the current screen image will be remapped to the new palette—producing a weird video flash. In order to avoid palette conflicts, you must produce a single optimized palette for all of the images in your HTML document. You'll find that standard image editors

ESSENTIAL OPTIONS FOR .GIF FILES

Vendor	Product name	List price	Optimized palette	Multiple files optimized to a single palette	Transparency	Transparent version of any color	Interlacing
Adobe Systems Inc.	Adobe PhotoShop v3.0.5	$895.00	U		U	U	U
Corel Corp.	Corel PhotoPaint	$289.00	U		U	U	U
Fractal Design Corp.	Painter 4	$549.00	U		U	U	U
Handmade Software Inc.	Image Alchemy/386 v.1.8	$199.95	U	U	U	U	U
Micrografx Inc.	Picture Publisher 6.0*	$299.95	U		U	U	U
Quarterdeck	HiJaak 95	$59.95	U		U	U	U
Ulead Systems Inc.	PhotoImpact	$199.00	U		U	U	U

* Picture Publisher 6.0 is a component of ABC Graphics Suite.

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programs (see the table "Essential Options for GIF Files") don't make this easy. But dedicated graphics programs such as Handmade Software's Image Alchemy have automated the process and create a single optimized palette from a group of designated files.

Finally, when it comes to arranging pixels into patterns, dithering (sometimes referred to as *diffusion dither*) is preferable to either solid colors (the None option) or a regular pattern. Solid areas of color typically result in posterization, which is a fine Peter Max effect, if that's your intention. Patterning, especially on low screen resolutions, produces a noticeable checkerboard that can interfere with the image. The dithered option has two benefits. First, it allows the software program to intermingle pixels of two or more colors to create the illusion of a new color. Alternating yellow and blue pixels, for example, can produce an optical mixture of green. Dithering also helps soften the transition from one color to another and thus avoids obvious banding in gradated fills.

USE COMPRESSION METHODS

Graphics file formats incorporate compression/decompression algorithms as part of the file open/save or import/export operation. The .GIF and JPEG formats both use sophisticated compression algorithms, but they differ in that .GIF incorporates a lossless compression method and JPEG a lossy method.

.GIF files are built around the lossless Lempel-Ziv-Welch (LZW) compression scheme. Lossless compression preserves all of the visual data in a picture: No information is discarded or altered during the compression/decompression operation. The compression scheme looks for complex repeated patterns within an image. By notating these larger patterns, rather than storing RGB values for each and every pixel in an image, LZW compression yields significant, if not startling, file-size reductions. A 2:1 compression ratio (where a compressed file is approximately half the size of an uncompressed file) is not uncommon.

In contrast, JPEG is a lossy compression scheme. It achieves very high compression ratios by discarding data. As a result, when the compression ratio gets too high, image quality can be affected. Figure 3 compares three different images. With no compression, the first image logs in at a hefty 203K. Using the Medium setting in Photoshop preserves image quality *and* drops the file size down to only 12K, for a compression ratio of 17:1. The last image, which exhibits some blocky artifacts, requires only 9K of disk space. It was produced by converting the image in a dedicated graphics utility program (Inset Systems' HiJaak 95) at a quality setting of 90.

JPEG compression has another significant disadvantage. Although high compression ratios do result in smaller files and smaller files download more quickly, compressed data takes longer to decompress before it can be displayed on screen. In most cases, the lengthy decompression process cancels any time savings achieved from faster downloads.

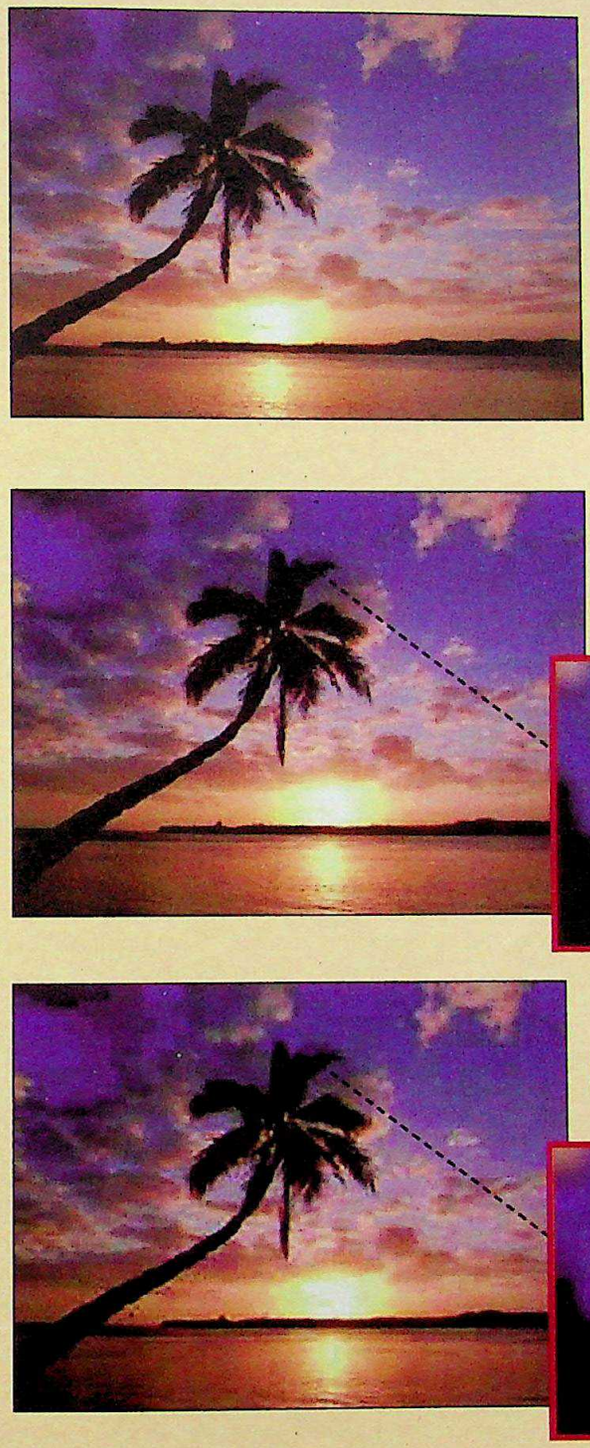


FIGURE 3: *JPEG, a lossy compression scheme, achieves very high compression ratios by discarding data. Notice, however, that the image quality does suffer. In the figures below, you can see how the image becomes blocky at higher compression ratios.*

Compression setting: None
File size: 203K

Compression setting: Medium
File size: 12K

Compression setting: 90
File size: 9K

MAKE DOWNLOADING SEEM FASTER

You can tweak your graphics files to make it seem as if the images are downloading faster than normal. The .GIF format, in particular, supports a feature called interlacing, which basically keeps track of the odd-numbered and even-numbered scan lines in a picture separately. At download time all of the odd-numbered scan lines are transmitted first. The result, from the end user's point of view, is that the "full" image appears on screen in half the time. That's because the image consists of only half the data (every other scan line): Although it appears faster, it is also blurry. The image will come into focus as the second half (the even-numbered scan lines) of the data is downloaded. In truth, interlac-

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ing doesn't shorten the actual time it takes to download the entire .GIF file. But because the "entire"—albeit blurry—image is displayed, the psychological effect is the same as speeding up transmission.

Until very recently, only .GIF files offered the benefits of interlacing. A new flavor of the JPEG format, however, called progressive JPEG (or PJPEG), produces the same result. The format is so new though that you won't find many programs supporting it. Currently, Ulead Systems' PhotoImpact is the only program on the market that can write progressive JPEG files. By the time you read this article, however, a Photoshop plug-in (also available as a standalone program) called Transmogrifier, from InTouch Technologies (617-332-6800; $22.00 for the full-featured plug-in, $12.00 for a streamlined standalone version), should be available for Windows. Until then you'll have to wait for upgrades to your favorite image editing program and for other Mac-based utilitites to migrate to the PC. Rumor has it that a Windows version of the popular Mac-based file conversion program DeBabelizer, from Equilibrium Technologies (*http://www.equilibrium.com*), is under development.

An even simpler way to increase the apparent speed at which images appear in your HTML documents is to use an image more than once. Web browsers cache images after downloading them. When an image is already stored on the local hard disk, it is displayed faster on subsequent pages. This is an ideal technique for a company logo, which can (and probably should) appear on every page of your document.

You can also repeat a picture to good advantage by using it as a background pattern or wallpaper motif. You will need to work with the HTML 3.0 specification, but given that requirement, wallpaper is rather easy to implement. You simply designate a graphic file as part of the BODY BACKGROUND HTML tag. Provided that the picture is smaller than the browser's window, the image is automatically tiled. This technique works best when done subtly. The graphic should appear as a lightly tinted watermark, so that it doesn't interfere with the legibility of the text on your page.

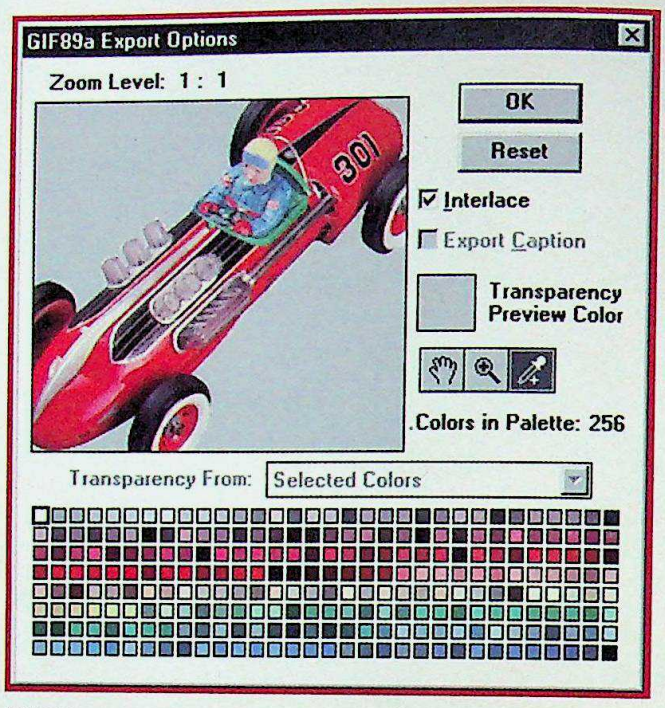


FIGURE 4: *Transparency options in the Photoshop 3.0.5 .GIF 89a export dialog box.*

.GIF OR JPEG?

Now that you have all this information about JPEG and .GIF formats, the question remains: Which format do you choose for your HTML documents?

If you're looking for absolute compatibility with the broadest range of browsers on the Web, choose the .GIF format. There isn't a graphical browser that doesn't support it. .GIF also offers one feature not found in the JPEG format: transparency. This may sound like a frivolous feature, but it allows you to create silhouettes against the background color of the HTML page. Using silhouettes addresses another limitation of HTML formatting. As with font choice, you (as the publisher) can't control the color of the HTML page; the end user's browser does that. Because you can't anticipate the color of the background in a reader's browser, you can't simply color the background of your page to match it. Instead, you must make the background of your graphic transparent.

Figure 4 shows the transparency options in the Photoshop 3.0.5 .GIF 89a export dialog box. Notice that you can make more than one color transparent, and you can select the color either from the palette or directly from the image.

JPEG should be your file format of choice if you are working with photographic images with lots of subtle color and tonal information. Because you don't have to reduce 24-bit color down to only 8 bits of data (or 256 colors), you have a much better shot at faithfully reproducing images in JPEG.

No matter which of the two formats you decide to use, the techniques discussed here will help you create efficient graphics for your Web site that will enchant the sensibilities of your readers without making unrealistic demands on their system resources. □

Luisa Simone is a contributing editor of PC Magazine. She is the author of Microsoft Publisher by Design, *now in its third edition, and co-author of the book* The Windows95 Scanning Book *(both from John Wiley and Sons) contains more information on creating and manipulating raster graphics.*

New Graphics Formats for Navigator 2.0

While JPEG and .GIF are the de facto standards for viewing graphics online, new technology that will enable you to view many different graphics formats has already arrived on the scene in the form of plug-in additions to Netscape Navigator 2.0. Netscape, of course, is only one of the many different browser applications that you may use to peruse your documents. But if you're confident that your readers will be using Netscape, you can incorporate a wide variety of graphics formats into your HTML documents.

Using plug-in technology, you can incorporate vector formats into your documents, such as the CGM format (using InterCAP's MetaLink RunTime CGM), AutoCAD's DWG/DXF format (SoftSource's DWG/DXF), or Corel Draw's CMX format (Corel Corp.'s CMX Viewer). Several plug-in products support a variety of formats. For example, Carberry Technology's FIGLeaf Inline allows Navigator to display .CGM, .PNG, TIFF, .BMP, .WMF, and EPSF files.

Plug-ins also provide access to cutting-edge graphics formats that provide higher compression ratios and better image quality for raster images. For example, Fractal Viewer reads the highly compressed and resolution-independent raster fractal format developed by Iterated Systems. And two products, Wavelet Image Viewer by Summus and Lightning Strike by Infinet Op, let Navigator users view wavelet-based images online.

For more information on any of these products, check out Netscape's Web page at *http://www.netscape.com.*

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PC Tech/Lab Notes

By Mark L. Van Name and Bill Catchings

The New Standard in 32-Bit Windows Testing

Winstone 32 measures performance on the new generation of 32-bit code.

The Windows market today is in transition, moving from 16-bit to 32-bit applications. The 16-bit packages that dominated a year ago are still in wide use with Microsoft Windows 3.1*x* and many Windows 95 systems. But most new releases are 32-bit programs designed to run natively on Windows 95 and Windows NT. With this issue's PC reviews, PC Magazine Labs introduces Ziff-Davis's Winstone 32, a 32-bit benchmark test program designed to measure a PC's performance when running this new generation of 32-bit Windows applications.

Winstone 32 is a 32-bit sibling of ZD's Winstone 96, the industry standard for measuring the performance of systems running 16-bit Windows applications. Both benchmark test programs also take the same basic approach: They use scripts that exercise real applications to produce measures of a PC's overall performance.

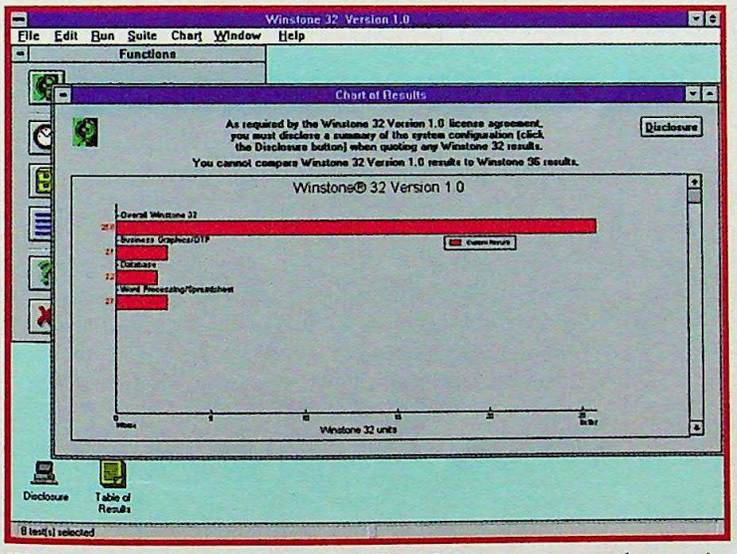
The key area in which the two test suites differ is in the applications their tests employ. Winstone 32 uses leading 32-bit Windows apps to put PCs through their paces; Winstone 96 measures system performance using leading 16-bit applications only.

The different purposes and application sets of the two Winstone versions gives them different operating-system requirements. Winstone 32 targets the platforms hosting today's and tomorrow's 32-bit apps, Windows 95 and Windows NT. Winstone 96 concentrates on the leading Windows platforms for 16-bit applications, Windows 95 and Windows 3.*x*. Together, the two benchmark test programs give *PC Magazine* an unmatched ability to gauge overall PC performance.

GUIDING PRINCIPLES

Winstone 32 shares with Winstone 96 a few key underlying principles. Both are market-centered benchmark test programs that aim to measure the performance typical PC users will see while conducting common operations with leading business applications. The scores they produce will be useful to the vast majority of us, because most users spend a great deal of computing time working with the same basic classes of applications.

Not everyone, of course, fits this profile. If all you do with your computer is run circuit-simulation packages, Winstone 32's scores won't be as meaningful for you as for typical business application users. Fortunately, another ZD benchmark test program, WinBench 96, contains hundreds of tests that gauge the performance of just about every aspect of every major PC subsystem. With it, you can focus on precisely those PC subsystems that most affect your work.



Winstone 32 provides both an overall performance score and scores in three application categories: Business Graphics and Desktop Publishing, Database, and Word Processing and Spreadsheet.

Winstone 32, like Winstone 96, is application-based. It runs real applications (not special crippled or demo versions) through a series of scripted activities. We have selected those activities by looking at extensive surveys of the way users work with leading business applications. Each score produced by Winstone 32 reflects the time a PC needs to complete those activities.

SETTING UP TO TEST

Like other ZD benchmark test suites, the complete Winstone 32 product—exactly the same software we use in our tests—is available to the public free of charge. Winstone 32 is included in the newest release of the Ziff-Davis PC Benchmarks CD-ROM, which also contains our Winstone 96 and WinBench 96 test suites (see the sidebar "How to Get Copies of Winstone 32"). Over the past few years, we've distributed millions of copies of ZD benchmark tests, and organizations of every size use them today as purchasing standards. Winstone 32 brings you the additional ability to zero in on 32-bit Windows application performance.

If you've worked with either Winstone 96 or WinBench 96, you will feel at home with Winstone 32. It shares the same simple installation process and interface as those benchmark tests. Installation is a matter of clicking a few buttons. Once you launch the benchmark test program and acknowledge the license agreement (first time only), you can produce system scores with just a click of the large Run button.

You do need to set aside some disk space, however. A full Winstone 32 installation requires 70MB of disk space for the applications and test code, plus an additional 30MB for the working directory in which Winstone 32 will run its tests. If you're short on disk space, you can also run Winstone 32 directly from the PC Benchmarks CD-ROM or from a server. In either of those cases, the only local storage Winstone 32 requires is the space for its working directory plus executables and relevant files.

Windows 95 and Windows NT are clearly different computing environments, and you should test under the OS you plan to use. If you're testing on Windows NT 3.51, Winstone 32 requires that you have NT's Service Pack 1 or later installed. (You can download the latest Windows NT service packs from *http://www.microsoft.com*.)

The PC Benchmarks CD-ROM includes an extensive reference manual covering all the details of running the product. It also has online help files and a short testers' handbook with all the facts you need to start a test run.

OBTAINING MEANINGFUL RESULTS

The hard part about testing is making sure you achieve accurate, repeatable results and

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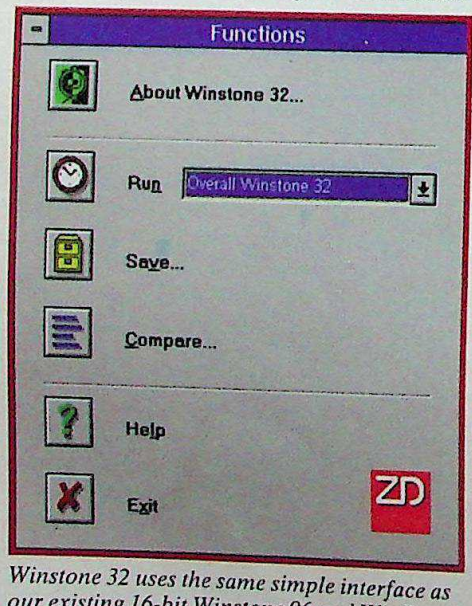
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that you use those results to make meaningful performance comparisons. Both the test procedures and the system configuration options, such as the amount of installed RAM, will unavoidably affect your results. That's fair, because those same factors will also affect your PC's real-world performance.

When we test PCs with Winstone 32, we employ a set of basic standard testing procedures, outlined in Winstone 32's documentation. If you follow these procedures, your test results will be both accurate and repeatable: Winstone 32's scores will not vary by more than about 3 percent across multiple runs on the same PC (in the same configuration and running the same operating system, of course).

If you do nothing else, you should try to defragment the PC's disk and reboot the system each time before you run Winstone 32. You should also make sure no other applications are active while Winstone 32 is running. Otherwise, the system resources that any active applications consume will affect the PC's Winstone 32 performance, as it would affect the performance of running applications under the same conditions.

Proper test procedure is only half of good benchmark test use; the other half is context. Winstone 32 results are meaningful only in comparison with other Winstone 32 results. It does you no good, for example, to know that system X produced a Winstone 32 score of 60 without the Winstone 32 scores of other PCs for comparison. The critical importance of context is one reason our reviews always provide multiple results and a great deal of configuration information about the PCs and peripherals we test. This data lets you make apples-to-apples comparisons and provides a clear picture of the ranges of results that different types of PCs can produce.



Winstone 32 uses the same simple interface as our existing 16-bit Winstone 96 and WinBench 96 benchmark test suites.

We feel strongly that vendors quoting Winstone 32 results should provide similar types of configuration information. In fact, Winstone 32's license agreement requires them to do just that. If you're using Winstone 32 to help make buying decisions or recommendations from among a group of systems, it's important to hold all the configuration variables constant (CPU type, amount of RAM, and so on) or to recognize the importance of the variables you change.

How to Get Copies of Winstone 32

If you would like a copy of the CD-ROM that contains Winstone 32, as well as the 16-bit benchmark test suites Winstone 96 and WinBench 96, send a postcard to :

Ziff-Davis Benchmark Operation
1001 Aviation Pkwy., #400
Morrisville, NC 27560
Attn.: Distribution coordinator

With all requests, please include your name, address, and phone number, and note that you want the PC Benchmarks CD-ROM containing Winstone 32. Please allow four to six weeks for delivery. If you'd like faster delivery, enclose your Federal Express account number and Federal Express shipping instructions. The CD-ROM includes online copies of the manuals for Winstone 32 and the other PC benchmark test suites.

INSIDE WINSTONE 32

To determine which applications to use in Winstone 32, we consulted with Computer Intelligence/InfoCorp (CII), a leading market research company (and another division of our parent company). We chose the 32-bit business applications with the largest current and projected unit market shares. The result was the following set of eight applications in three categories:

- *Business Graphics and Desktop Publishing:* Adobe PageMaker 6.0, Corel Systems' CorelDraw 6.0, and Microsoft PowerPoint 7.0.
- *Database:* Borland International's Paradox 7.0 and Microsoft Access 7.0.
- *Word Processing and Spreadsheet:* Lotus Development Corp.'s Word Pro 96, Microsoft Excel 7.0, and Microsoft Word 7.0.

Those familiar with Winstone 96 will recall that it contains separate Word Processing and Spreadsheet categories. Winstone 32 combines these two into a single category, because few of the leading word processing and spreadsheet applications were available in 32-bit versions when we completed developing the benchmark tests.

When you press Winstone 32's Run button, the test program starts its tests. It measures a PC's performance by exercising each of these eight applications in turn, using an appropriate test script for each. The scripts, which ZDBOp developed using Microsoft Visual Test 4.0, take each application through a series of tasks that reflect extensive surveys of typical user application activity.

To produce its score, Winstone 32 first times how long the PC takes to complete each script. It then normalizes the unit's times against the time that a base machine—a D... PC with a 25-MHz 486SX CPU and 8MB RAM, running Windows 95—took to co... plete the same script. Winstone 32 uses t... normalized scores and the unit market-s... weight of each application in a category to c... culate a weighted harmonic mean, the sc... for that category. Then the test program ta... the category scores and the unit market-sh... weights of the three categories to calculate ... other weighted harmonic mean, the ove... score. Finally, Winstone 32 converts the ov... all score to a number relative to the ove... score of the base machine, which by defini... we set to 10.0. Winstone 32 also scales t... three category scores against a score of 1.0 f... the same base machine. We chose the diff... ent scaling factors so you could easily ... overall scores from category scores.

Higher Winstone 32 scores represent be... performance. For example, a machine with ... overall score of 20.0 is twice as fast on the... leading 32-bit business applications as the ba... machine. Note that both Winstone 32's overa... score and its category scores measure the pe... formance of a PC as a whole system. If you w... to focus on the performance of any one subsy... tem, such as the graphics or disk subsystem, ... use the appropriate tests from WinBench 9...

We mentioned earlier that you can r... Winstone 32 from a server, from the P... Benchmarks CD-ROM, or from your hard dri... once you've installed it there. No matter h... you run it, though, Winstone 32 goes thro... the same testing process. First, it copies t... files each application needs to run to a wor... ing directory, which should be on a hard dri... of the PC you're testing. It then runs its te... script for each application from that directo... Winstone 32's internal timing mechanisms ... sure that all three methods produce the sam... result on a given PC with a given configurat... and operating system.

Winstone 32's minimum RAM requir... ments depend on the operating system you ... using. With Windows 95, Winstone 32 re... quires at least 8MB of system RAM to exe... cute. With Windows NT, the minimum ... 12MB of RAM. These are definitely minimu...

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Winstone 32

Winstone 32, based on eight leading 32-bit Windows applications, lets you measure the performance of a PC running 32-bit software.

- Winstone 32 is our first desktop benchmark test suite for systems running Windows NT.
- Winstone 32 runs on Windows 95 and Windows NT 3.51 (or later) with Service Pack 1 (or later). Because Winstone 32's 32-bit applications use the 32-bit Windows API, Winstone 32 will not run under Windows 3.1 or OS/2.
- Winstone 32 provides both an overall system performance score and scores for performance in three application categories: Business Graphics and Desktop Publishing, Database, and Word Processing and Spreadsheet.
- Winstone 32's application mix is based on new market-share data for 1995 and projections for 1996.
- Winstone 32 uses the same interface as Winstone 96, so it's easy to start testing right away.
- By using both versions of Winstone, available free on a single CD, you can test a PC's performance running 32-bit applications (using Winstone 32) as well as 16-bit applications (using Winstone 96).

counts, however, which is why we typically test PCs with more RAM.

WINSTONE 32 AND 96: NOT COMPARABLE

Winstone 32 and Winstone 96 are similar enough in design that it may be tempting to try to run both benchmark test programs on the same PC and compare the results. Or you may want to compare the Winstone 32 scores of one PC with the Winstone 96 scores of another. Resist this temptation. You cannot meaningfully compare the results of the two Winstone products. Several significant differences between the benchmark test programs make such comparisons invalid.

For one, while the two kinds of scores are calculated with reference to the same physical machine, their results are derived from two different operating systems. For Winstone 32, the base machine was running Windows 95, while for Winstone 96 it was running Windows 3.1. This difference is very important, because these two operating systems place different demands on the machine.

In addition, Winstone 32 runs a completely different set of applications from Winstone 96. Even though some of the applications in both benchmark test programs share the same publisher and product name, the applications themselves are quite different from each other. Different applications means different weights: Winstone 32's weightings obviously reflect the market shares of the apps it uses, while Winstone 96's weights involve its set of applications. But you can certainly use Winstone 32 to gauge a PC's 32-bit Windows performance and use Winstone 96 to measure the same PC's 16-bit Windows performance.

As the industry continues its migration to 32-bit applications, so too will our benchmark tests. At the Fall Comdex, we'll introduce Winstone 97 and WinBench 97, both 32-bit benchmark test programs. We plan to discuss these new releases in a future issue. □

Mark L. Van Name is the vice president of product testing for Ziff-Davis Publishing Co. Bill Catchings is the director of the Ziff-Davis Benchmark Operation, the research and development division of Ziff-Davis that produces the company's benchmark tests.

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If you have any concrete suggestions that you feel will help us improve the quality of the magazine, please do not hesitate to write to us. We will be grateful.

Jot down your response on a sheet of paper and mail it to the Editor, *PC Magazine India*, A39 NDSE Part II, New Delhi 110049.

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BILL HOWARD

Frontiers of Benchmark Testing

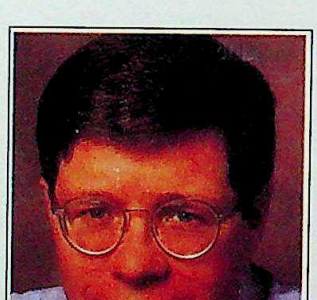
In the PC industry, the anything-goes, shoot-'em-up spirit of the wild West prevails. For that, you can thank the graphics board vendors. They make good products, but they spend altogether too much time sniping at one another, criticizing their competitors' technologies, looking for shortcuts to better performance, and feuding with reviewers and test labs. I believe the products would be better if the vendors redirected some of that energy toward positive efforts, such as working on better boards and cleaner drivers.

Two years ago, I first visited this issue in my column "Memo to Vendors: Cut It Out!" (April 26, 1994). Six months before that column appeared, we had revised our Graphics WinMark tests, and the updated test results yielded numbers that were markedly lower across the board. So a couple of vendors who came close to achieving scores of 100 million pixels per second on the previous year's tests kept reporting and advertising the old scores, simply because they liked the idea of surpassing a nice even number such as 100 million. That's why we now append the year to the names of most of our test programs (Winstone 96, Graphics WinMark 96, and Disk WinMark 96).

Even though that problem no longer exists, others have since arisen. Here's some background on our most recent testing of 2-D and 3-D graphics boards, the results of which are reported in this issue in "The High and Mighty."

During our testing, one problem we came across involved GDI (graphical device interface) patching—a method of hot-rodding graphics boards. Like souping up a car, GDI patching can lead to unreliable results. Sometimes the car goes faster, but other times it breaks down. In this case, the vendors bypass certain GDI functions under Windows 95, resulting in a graphics performance boost of 10 to 15 percent. Note that this doesn't mean your PC runs 10 percent faster overall; graphics, of course, is only one aspect of overall system performance.

What makes it all the more interesting is that vendors who do patch GDI calls apparently wait until after the board is tested by Microsoft and certified as Windows 95–compatible. As we wrapped up the story, Microsoft had yet to make any official statement regarding the practice. But the preliminary indication from Redmond was that GDI patching isn't acceptable, because it can make your system less stable.



VENDOR VOODOO

Virtually every major graphics board vendor has been in the PC Labs doghouse at some point.

If you ever played Battleship as a kid ("I'm firing at grid B4," "You hit my battleship!"), you'll appreciate what happened next. We called the vendors who appeared to be bypassing the GDI. Here's the response from one (more or less verbatim): "We were planning to tell you, but we were waiting for you to call and ask, because we wanted to know how you felt about it." In other words, they figured they'd tell us if we hit their battleship. The upshot: Vendors who do this have now agreed they'll include a method that lets you enable or disable the GDI patch.

Then there was the problem with the vendor who advertised OpenGL support. OpenGL is a precise 3-D rendering technology that's important for CAD software and 3-D visualization (as opposed to 3-D for games, in which speed is all that matters). The more we tested, the more it looked as if the board actually ran slower than if you just let the operating system (Windows NT, in this case) take care of the functions. The vendor said maybe we weren't running the tests correctly. PC Labs has made a few mistakes in the past, but we didn't think we were in the wrong here. The vendor finally 'fessed up, admitting the driver doesn't work. The company offered us a trade: If you stop testing OpenGL performance, we'll issue a statement that our driver is defective.

Virtually every major graphics board vendor has been in the PC Labs doghouse at sometime over the past several years, including ATI, Diamond, Matrox, and Number Nine. They weren't cheating; let's just say they were trying to push their advantages a bit too far. This time around, it was Matrox more so than the others—the same company that had the OpenGL problem. Now here's the irony: For mainstream power users, bad boy Matrox Millenium also happens to have the best all-around board. That just goes to show: Even when we're annoyed with a company's sophomoric and counterproductive antics, we're still big fans of superior power, performance, features, and bang for the buck. And that's why the Matrox board won our Editors' Choice as the best 2-D graphics board. □

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Keep a Windows 95 Bug from Eating Your Filenames

I expect a new operating system like Windows 95 to have some bugs, but I've come across a really annoying one: In Explorer or any folder window, begin to edit a file or folder's name. Then—while still in edit mode—select View | Arrange Icons from the pull-down menu and choose a different sort order. Chances are good that by doing this, you'll screw up the name of another file or folder. Any ideas on how to prevent this?

KEVIN YIP, *Flushing, New York*

PC MAGAZINE: You can view this bug in action without risking filename damage, as long as you're careful. Open any folder window and click once on a filename, then click on it again. Two separate clicks (as opposed to a double-click) on a filename opens a tiny editing window for changing the name. Enter a new name, then use View | Arrange Icons to select a different sort order. Notice that the filename editor window does not move from its location in the window. Immediately press Esc to cancel the change.

What happens is that the files change order, but the filename editor window remains in the same location. If you press Enter or click outside the filename editor window, the file that's at that location in the current sort order will have its name changed. Suppose the files are ordered by size, and you're editing the name of the fifth file. If you now sort the files by date and press Enter, you'll change the name of the fifth file in date order. Press Esc and the change will be canceled with no harm done.

One way to avoid this problem is to get into the habit of using the right-click pop-up menu to arrange icons in a folder. When you right-click the folder window outside the filename editor window, the name change is completed and the editor window goes away. Now reordering the files won't have any undesirable side effects. If you do get caught by this bug, don't panic! As long as the editor window is still active, you can cancel the change by pressing Esc.

Teach Your New DOS an Old Trick

While there are many ways to build a secondary batch file from within a primary batch file, every approach I've encountered has fundamental drawbacks. I've found what I think is a better way.

Including indentation in a batch file has no effect on its execution, as COMMAND.COM ignores unnecessary spaces in front of a command. But well-formatted batch files are easier to read, so I decided to edit mine to remove the extra spaces. I used the TYPE command with the FIND filter to look for the lines that had too many spaces. I then realized that I could redirect those lines according to how many spaces they had in a row. Therein lies the key to my technique.

To embed a secondary batch file within a main batch file, type a GOTO command followed by its destination label. Between the command and the label, insert the lines of the secondary batch file, prefixing each with the same number of spaces (at least two). Since the GOTO command jumps over these lines, they are never executed by the main batch file. The neat thing about this is that there are no limitations on what characters the secondary batch-file lines can contain.

The main batch file creates the secondary batch file using a line like this:

```
TYPE MAIN.BAT |FIND "  "|FIND "   "
➥ /V >2NDARY.BAT
```

There are two spaces between the first pair of double quotes and three spaces between the second pair. The first FIND command selects all lines that contain two or more spaces, and the second, using the /V switch, rejects lines that contain three or more. If necessary, you can embed more than one secondary file by prefixing the lines of each with a different number of spaces.

I created the batch file in Figure 1 by combining the above technique with a technique for parsing strings using the CHOICE command that was presented in the January 9, 1996, column. This batch file strips the first character from a string and returns both the character and the remainder of the string. In DOS ver-

HIGHLIGHTS

HARDWARE Here are a few quick workarounds to try if you're having problems printing graphics documents to a LaserJet from your Windows 95 system. *Page 85*

WORD PROCESSING How and why it's possible to use field codes to create two sets of page numbers in Word for Windows. *Page 86*

DATABASES Paradox for Windows doesn't have the ability to eliminate blank lines on a form, but we've found a way to do it. *Page 87*

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```
::SNAP.BAT
::Accepts a string as a parameter
::Returns %STR1% (first char) and %STR2% (rest)
@ECHO OFF
GOTO START
::BUILD
 ::SNAP$$$2.BAT
 IF "%2"=="]?" RET
 SET STR1=%2
 :STR2
 IF "%3"=="]?" RET
 SET STR2=%STR2%%3
 SHIFT
 GOTO STR2
:START
TYPE C:\BAT\SNAP.BAT |FIND "  " |FIND "  " /V
➥>C:\BAT\SNAP$$$2.BAT
REM > C:\BAT\RET.BAT
ECHO;; |CHOICE/S/C;%1; C:\BAT\SNAP$$$2
➥>C:\BAT\SNAP$$$1.BAT
SET STR2=
CALL SNAP$$$1
DEL C:\BAT\SNAP$$$?.BAT
DEL C:\BAT\RET.BAT
```

FIGURE 1: *This batch file returns the first character of a passed string and the remainder of the string. (➥ indicates a continued single line.)*

```
::CHOP.BAT
::first parameter is string to split
::Second parameter is a string of x's
::Splits first string into %STR1% and %STR2%
::  where length of %STR1% matches length of 2nd
::  parameter
@ECHO OFF
IF '%2'=='' %0 %1 x
IF EXIST C:\BAT\CHOP$$$2.BAT GOTO Quick
GOTO START
::BUILD
 ::CHOP$$$2.BAT
 IF "%2"=="]?" RET
 SET STR1=%STR1%%2
 :STR2
 IF "%3"=="]?" RET
 SET STR2=%STR2%%3
 SHIFT
 GOTO STR2
:START
TYPE C:\BAT\CHOP.BAT |FIND "  " |FIND "  " /V
➥>C:\BAT\CHOP$$$2.BAT
SET STR1=
SET Count=
REM > C:\BAT\RET.BAT
:Quick
ECHO;; |CHOICE/S/C;%1; C:\BAT\CHOP$$$2
➥>C:\BAT\CHOP$$$1.BAT
SET STR2=
CALL CHOP$$$1
SET Count=%Count%x
IF NOT '%Count%'=='%2' %0 %STR2% %2
SET Count=
ECHO STR1="%STR1%"
ECHO STR2="%STR2%"
DEL C:\BAT\CHOP$$$?.BAT
DEL C:\BAT\RET.BAT
```

FIGURE 2: *CHOP.BAT, a variation on SNAP.BAT, splits its first parameter into two parts; the second parameter is a string of x characters defining the desired length for the first part.*

sions before 7, a quirk of the FOR command could be used to do this. DOS 7 removed this quirk, but a batch file like this one can replace it.

RICHARD A. ELLINGSON,
Paradise, California

PC MAGAZINE: This technique for creating secondary batch files has virtually no limitations and works with all modern DOS versions. You can create and test the secondary batch file separately, then incorporate it directly into the main batch file, as long as it doesn't contain any labels with the same name as labels in the main batch file.

Batch files that rely on auxiliary files will fail if one of those files goes missing. Also, since every file on disk occupies at least one cluster of disk space, a batch file solution that uses many small files is relatively wasteful. For these and other reasons, batch file experts frequently write a main batch file so it generates any necessary secondary files itself and deletes them when they're no longer needed.

The simplest way to generate a secondary file is to redirect the output of the ECHO command for each line, replacing any percent signs with doubled percent signs. Using redirection symbols in the lines of the secondary batch file, however, requires difficult and complex batch file programming.

The absence of the FOR command quirk mentioned here is one of a number of reasons that batch files written for older DOS versions often fail under DOS 7 (the DOS version that Windows 95 uses). To see the problem, enter this command at a DOS prompt:

```
FOR %v IN (/Neil) DO ECHO %v
```

In DOS versions before DOS 7, this command would echo "N" and "eil" separately, and batch files could use this behavior to split off the first character of a string. Advanced batch files extended this technique to perform complicated string formatting. Alas, under DOS 7 the same command echoes the single string "/Neil", and all batch files that rely on the earlier behavior fail.

The SNAP batch file in Figure 1 emulates the old FOR command behavior, returning the first character of the passed string in the S environment variable and the remainder in the STR2 environment variable. String-parsing batch files can CALL SNAP.BAT to avoid relying on the FOR command quirk. Figure is CHOP.BAT, a variation on SNAP.BAT that splits the passed string into two parts. Its second parameter is a string of x characters that is of the desired length for the first part. For example, the following command would return "Mag" and "azine":

```
CHOP Magazine xxx
```

CHOP.BAT uses its secondary batch file repeatedly, so it saves time by skipping the creation step when possible. Both of these batch files assume the existence of the directory C:\BAT on the PATH; change this if you store your batch files in a different directory.

You can download both of these batch files from PC Magazine Online. See the sidebar "Guide to Our Utilities" in this issue's Utilities column for instructions.

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Ask Our Advisors

HARDWARE

Nattering Notebooks

I need a good quality text-to-speech device for my portable computer, something that will either attach to the parallel port or plug into the PC-Card slot. I do a lot of work with textual and numeric data and want the computer to read it aloud so I can proof it more accurately and quickly. The product should be able to produce the words accurately and intelligibly—something equivalent to a child's toy won't do. Can you recommend a solution?

STAN FOSTER, *E. Lansing, Michigan*

PC MAGAZINE: The answer is actually pretty simple. Parallel-port sound devices are generally limited in terms of performance and sound quality, so you'll want to take a look at the new crop of sound card devices designed to fit in PC-Card slots. These can provide both digitized sound and MIDI support (as well as SCSI interfaces and game ports in some cases), making them the equivalent of a typical sound card you'd use in a desktop system.

The other part of the equation is the text-to-speech software. Many cards include such a utility as part of the standard software bundle, and a number of standalone products are available as well, with prices ranging from $50 into the thousands. These products have improved a great deal in recent years, though you're still not likely to mistake them for a human voice reading your data. But they're able to read text files well enough for you to understand them, which should be sufficient for your application.—*Alfred Poor*

LaserJet Lock-up

I recently acquired a new computer running Windows 95, and I'm encountering some printer problems. While text documents seem to print without difficulty, graphics pages that printed on my HP LaserJet 4L (with 1MB of memory) under Windows 3.1 now lock up my printer. HP suggested using the LaserJet III driver, but that results in an extra blank page for every printed page. Can you suggest a better solution?

KENNETH KALBERG, *Schaumberg, Illinois*

PC MAGAZINE: The short answer is that you probably don't need a new driver; you should have everything you need right at hand. For the complex graphics pages, you should be able to use the LaserJet 4L driver that comes with Windows 95. The problem you're experiencing is most likely caused by the print data stream overrunning your printer's controller. If you change the printer's settings in Windows 95, you may be able to get it to work properly.

First, open the Properties window for the printer (use the Printers icon in the Control Panel), and in the Details tab, choose Spool Settings and then "RAW" for the Spool Data Format. In the Device Options tab, move the memory tracking slider all the way to the Aggressive setting, and in the Graphics tab, select Use Raster Graphics for Graphics mode. In the Fonts tab, choose Print TrueType as graphics.

You can find out what each of these changes does by highlighting the option and pressing the F1 key, or by pressing the question-mark button in the caption bar and then clicking the option. Windows 95 opens a message window explaining the differences between the choices. For example, when EMF is your Spool Data Format,

ANNOUNCEMENT

In supersession of our previous announcement, there will be two issues of *PC Magazine India* each month except in May and December, when there will be one issue each. As before, there will be 22 issues in a year.

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you're using a metafile format that returns control to your printer more rapidly, while the RAW setting produces an output format specific for your printer that may result in slower performance.

These changes will slow print performance, but at least your print jobs should print. If the changes solve the problem, you can start reversing them one at a time to see which settings will give you better performance without crashing your printer. Since you haven't had problems with text anyway, try changing the TrueType as graphics to TrueType as bitmap soft fonts first, as this will have the most significant impact on text print jobs.

In case these changes don't solve your printing problems, let's see if we can eliminate the extra page you get when using the LaserJet III driver. The extra page could be the result of having your parallel port configured as a PS/2-style port instead of the standard LPT, ECP, or EPP modes. If you can reconfigure your parallel port through your system BIOS, this may provide the solution.

You can also try using a newer version of the printer port protected mode driver for Windows 95. Start by checking the properties for LPT.VXD in your WINDOWS\SYSTEM subdirectory (highlight the file in Explorer and right-click on the filename). Look at the Version screen, and if your file has a version number lower than 4.00.503, make a backup copy of the file and then copy the newer version from the DRIVERS\PRINTERS\LPT directory on the Windows 95 CD-ROM. Restart Windows and the problem should be eliminated.—*Alfred Poor*

OPERATING ENVIRONMENTS

Maximizing Your Compressed Drive

Can you explain how DoubleSpace selects an estimated compression ratio for a hard disk? The allowable range for this ratio varies wildly from machine to machine, and the compressibility of the files on the disk does not appear to be one of the deciding factors.

I have a 425MB disk, 422MB of which is devoted to the compressed volume file. With 170MB on the compressed drive, DoubleSpace from DOS 6.20 reports a compression ratio of 2.0 to 1 and an estimated ratio of 1.3 to 1. DOS reports 512MB of total disk space. When I try to change the estimated compression ratio, I'm prompted to "Enter a number between 1.0 and 1.3." Any number out of this range is rejected. DOS cuts me off at 512MB, no matter what compression ratio I enter.

I feel cheated. DoubleSpace has compressed my files, but it won't let me use most of the space it created because of a technicality. Is there a way I can utilize this space?

ROB NICHOLS, *Rocky Point, New York*

PC MAGAZINE: You've put your finger on the source of the trouble(DoubleSpace cuts you off at 512MB. Both DoubleSpace and its successor, DriveSpace, use 8K clusters internally and are still subject to the File Allocation Table limitation of no more than 65,536 clusters. Multiply the cluster size by the maximum number of clusters and you get 512MB, the maximum size for a DoubleSpace drive. Divide 512MB by your compressed volume file size of 422MB and the result is close to the proposed 1.3 to 1 ratio.

Thus, the maximum sensible size for the compressed volume file is 512MB divided by the compression ratio you expect. If you expect a compression ratio of 2.0 to 1, you'd be better off allocating your 422MB of disk space to *two* compressed volume files, each smaller than 256MB.

Note that the DriveSpace 3 update included in the Windows 95 Plus! Pack raises this limit to 2GB. If your expected compression ratio is 2.0 to 1, you can compress an entire 1GB drive without worry or waste. DriveSpace 3 also adds more control over the compression process, including the ability to perform the initial storage of files without compression and compress them later when the system is idle.—*Neil J. Rubenking*

WORD PROCESSING

Dual Page Numbering In Word for Windows

When working with long technical documents, you often need two sets of page numbers, one set for the section and the other for the complete document. Word for Windows doesn't have a built-in dual page-numbering command, but there is a way to use field codes to add page numbers.

First, place these two field codes at the start of the document:

```
{SEQ variable1 \h \r {SectionPages} }
{SEQ variable2 \h \r0}
```

Next, set the entire document to restart numbering at page 1 for each new section. To do this, use Ctrl-NumPad 5 to select the entire document, choose Insert | Page Number, click on the Format button, and then set the Page Numbering box to start at 1. (This will enter a {Page} *field in the footers, which you can remove if you like.)*

Place the following field codes at the beginning of each section in the document after the first one:

```
{SEQ variable2 \h \r{={SEQ
➥variable1 \c} } }
{SEQ variable1 \h \r {={SectionPages}+
{SEQ variable2 \c} } }
```

The following will place the page number in the current section in the headers or footers:

```
{Page}
```

Finally, the field code:

```
{={SEQ variable2 \c}+{Page}}
```

will give you page numbers for the entire document.

MATTHEW POLLARD
Eldridge, Maryland

PC MAGAZINE: This technique works as promised; however, the reason it works may not be immediately obvious. Let's go through it step by step, starting with the result and then figuring out how we got there.

To enter fields, simply press Ctrl-F9, which inserts the field code markers, and then type the text between the markers. For nested fields, you can enter markers within markers the same way.

The {Page} field is designed to give the page number in the current section. What's missing is a way to track the overall page number separately. This field manages that trick:

```
{={SEQ variable2 \c}+{Page}}
```

This sets the value of the SEQ, or sequence, field, to match the total number of pages in previous sections and adds that value to the {Page} field in order to get the total number of pages.

For this to work in the first section, the SEQ field must have a value of 0. That's a little tricky, because the SEQ field's primary job is to let you number items in sequence. If you enter the field {SEQ variable} three times in a row, the field results will be 1, 2, and 3. But the \c switch in the SEQ field for overall page number tells the field to repeat the current value for the variable rather than increment it. So all you have to do is make sure that variable2 is set to 0 at the beginning of the document.

That's precisely what this field at the beginning of the document does:

```
{SEQ variable1 \h \r {SectionPages} }
```

The \r switch sets the value for the variable named in the SEQ field, setting it to whatever number you enter immediately after the switch. So the \r0 in the following field sets variable2 to 0:

```
{SEQ variable2 \h \r0}
```

Getting the correct starting number for later sections is a bit harder, but that's what the rest of the fields are for. The first field

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beginning of the document takes advan-
of the {SectionPages} field, which re-
the number of pages in the current sec-
More precisely, it uses the \r switch to set
iable1 to the number of pages in the first

tion.
The first field at the beginning of the sec-
section resets variable2 to match the
ber of pages in the first section (by setting
match the current value of variable1):

```
eq variable2 \h \r{={SEQ
riable1 \c} } }
```

makes the field for overall page number
header become the number of pages in
ion 1 plus the {Page} field.
The second field at the beginning of the
ond section resets variable1 to match the
ber of pages in section 1 plus the number
pages in section 2:

```
eq variable1 \h \r {={SectionPages}+
eq variable2 \c} } }
```

r all later sections, the same pattern re-
s. The first field resets variable2 to match
e number of pages in previous sections, so
u can calculate the current page right in the
der. The second field resets variable1 to
tch the number of pages in previous sec-
s plus the current section.
The only part I haven't mentioned yet is the
switch. This hides the field results so that
e fields in the document itself won't show on
een or on the printed page.
An important drawback of this technique is
t if you leave the fields hidden, you can
sily delete one or more fields accidentally
d ruin the numbering. One way around that
to set Word to show all fields. Alt-F9 will
ggle between showing fields and showing
ld results.
There is another way to get dual page num-
s, but since we don't have the space to dis-
s it in detail, I'll briefly summarize it. The
rnative involves adding a bookmark to
ch section break, using different headers in
ch section, and calculating the number of
ges in previous sections using the {PageRef}
ld. Since the bookmark is marking the sec-
n break, you would have to delete the sec-
n break to delete the bookmark, which
re not likely to do.
If the bookmarks are named EndSec1,
dSec2, and so on, the field for the overall
ge count in section 2 would be {={PageRef
dSec1}+{Page}}, the field for section 3
uld be {={PageRef EndSec1}+{PageRef
dSec2}+{Page}}, and so on. The drawback
this approach is that the fields get unwieldy
er a few sections and you may have to re-
e them if you delete or move a section. The
od part is you won't have to worry about
identally deleting a field.

—*M. David Stone*

SPREADSHEETS

Exporting an Excel Workbook to a Text File

Someone in my organization created a catalog order-entry workbook in Excel that displays products and allows the salespeople in the field to enter quantities. The spreadsheet does some rudimentary calculations and prints a nice copy of the order. The salespeople love it. Unfortunately, when it gets back to the office, it needs to be uploaded into the company mainframe—and here is where the problems begin. Microsoft says it's not possible to export the whole workbook at once; it must be done one worksheet at a time. Each order can contain up to 79 worksheets, though, so that's not very feasible.

I can write a macro that strips off the headings of each sheet and puts all the lines that have quantities entered in them on one sheet, which can then be exported. But my macro would be specific to the catalog; that is, new catalog information would require building a new macro, and that's not very practical either.

Can you tell me if there's a generic way to get all the sheets of the workbook dumped out into a flat file that can then be exported to the mainframe?

DONALD J. VARNEY, *Newport, Vermont*

PC MAGAZINE: I assume your mainframe needs a plain ASCII file, and you're quite right—Excel's text-export routine works on the current worksheet only. (For the sake of comparison, you might be interested to know that the equivalent command in Lotus 1-2-3 Release 5 operates on all pages of the current spreadsheet file. Quattro Pro, on the other hand, behaves the same way as Excel.)

My suggestion is to install the Windows Generic / Text Only printer driver, set the driver so it prints to a file, then print to that driver. That will get you a plain-text file, suitable for uploading to the mainframe. And unlike the official text-export routine, the Print command can be applied to entire workbooks (or any set of particular sheets).

Before you print your workbook to a file, you might want to use Excel's Page Setup command to set your top, bottom, left, and right margins to zero. That will reduce extraneous white space. Consider, too, whether you want headers and footers. If your pages are short, you might want to let Excel print the sheet name as a header for each sheet in your workbook. On the other hand, if your sheets run to multiple pages, such headers will give you unwanted text in the middle of your data.

Finally, be sure your columns have adequate width. Because the fonts used on screen may be narrower than the font used by the Generic / Text Only printer driver, some columns that look fine in Excel may show up as number signs in your print-out. You can circumvent this problem by widening your columns before printing.—*Craig Stinson*

DATABASES

Colorful Code in Visual FoxPro

Microsoft has color-coded syntax editing in Visual Basic's editor, but this feature is inexplicably absent in Visual FoxPro. FoxPro exposes hooks that let third-party vendors tap into the editor, so it seems logical that someone might add this feature externally. Do you know of any third-party packages that add color to FoxPro's editor?

KAREN ABRAHAM
Atlanta, Georgia

PC MAGAZINE: I know of only one, a shareware package called XiLights, which you can download from CompuServe. The product is a FoxPro add-on library that comes in two versions, one for Visual FoxPro and one for Microsoft FoxPro for Windows. You load it via the SET LIBRARY TO command, and it thereafter adds color to the Editor, Command, and Trace windows.

You can assign individual colors to eight different code elements:

- user text
- FoxPro keywords like USE or BROWSE
- string constants
- numeric constants
- flow constructs like DO WHILE or DO CASE
- comments
- compiler directives (like #define)
- system variables

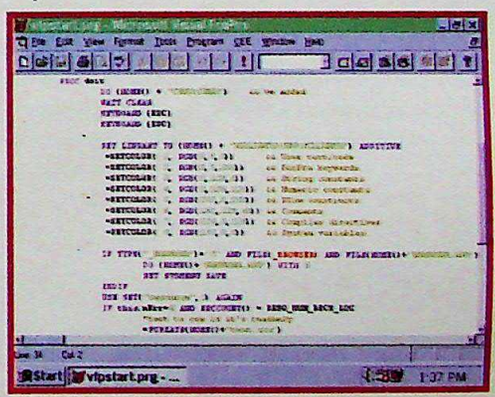


FIGURE 1: *You can add a touch of color to FoxPro or Visual FoxPro's editing environment using a shareware package called XiLights.*

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```
--[Line Two]
iif([Table.Address Line 1]="",
   iif([Table.Address Line 2]="",
      [Table.Address Line 3],
      [Table.Address Line 2]),
[Table.Address Line 1])

--[Line Three]
iif([Table.Address Line 1]="",
   iif([Table.Address Line 2]="",[Table.City]+",
   "+[Table.State]+
   " "+[Table.Zip],[Table.Address Line 3]),
[Table.Address Line 2])
```

```
--[Line Four]
iif([Table.Address Line 1]="",
 iif([Table.Address Line 2]="", [Table.Country],
    [Table.City]+", "+[Table.State]+" "+[Table.Zip]),
 [Table.Address Line 3])

--[Line Five]
iif([Table.Address Line 1]="",
 iif([Table.Address Line 2]="", "", [Table.Country]),
 [Table.City]+", "+[Table.State]+" "+[Table.Zip])

--[Line Six]
iif([Table.Address Line 1]="", "", [Table.Country])
```

FIGURE 2: *You can use IIf logic to close up blank spaces in an address on a form, provided you store the address with the blank address lines f*

XiLight's default colors were evidently designed to emphasize a splash of color, so you'll probably want to change them to suit your own style. Figure 1 shows a sample using the default colors.

You can set the colors via an .INI file or using the supplied SETCOLOR function. You can also turn color on and off without unloading the library using the COLORMODE function. XiLights is shareware, and as such you are encouraged to register via a reminder that pops up now and then. You'll want to register quickly, because the reminders are definitely annoying. The $45 price seems a little high for this type of utility, but you might find the color-coding easier on your eyes and therefore worth the price.

To give XiLights a try, download a copy from the Visual FoxPro forum on CompuServe (GO CIS:VFOX). Look in the FLL library. Or contact the authors at one of the following addresses: Xitech Inc., 4222 Airport Hwy, #4, Toledo, OH 43615; 419-382-0001; or Xitech, The Lindens, Chantry Lane, Hatfield, Herts, AL10 9PH, U.K.; phone, +44 1707 276637.
—*Sal Ricciardi*

Suppressing Blanks in Paradox Forms

Paradox for Windows has the ability to eliminate blank fields and lines on a report, but there is no way to delete them on a form. Because I wanted the records in our public online address list to appear on a form without intervening blank lines, I came up with a way to suppress the blank lines.

Our addresses consist of a name and from one to three address lines, followed by a line for city, state, and zip code and a line for country. In an attempt to make the addresses look less "computerized," I use unlabeled fields and place each component of the address in a text box on a separate line. A sample address on my form might look like this:

David Hume	*Name*
	Address line1
	Address line2
1035 5th St.	*Address line3*
Bronx, NY 23534	*City, St, Zip*
USA	*Country*

Note the two empty address lines. To eliminate the blank lines that result from empty address lines, I make each line below the name a calculated field using embedded Immediate IF statements as shown in Figure 2. Each calculated field adjusts its output depending on the contents of the fields that appear earlier in the address. Thus, the sample address on the form becomes:

David Hume	*Name*
1035 5th St.	*Address line3*
Bronx, NY 23534	*City, St, Zip*
USA	*Country*
	Address line1
	Address line2

For the technique to work, the field objects on the form should be arranged like this:

```
Name
[FORMULA]
[FORMULA]
[FORMULA]
[FORMULA]
[FORMULA]
```

Each formula corresponds to the IIf statements in Figure 1. The technique works fine in Paradox for Windows, Versions 4.5 and 5.0.

BERNARD PEGIS,
Santa Paula, California

PC MAGAZINE: You can remove blank lines in Paradox reports through skillful use of the "Delete when empty" Run-Time property, but there's no equivalent property for objects on Paradox forms. The technique shown here relies on changing field objects into calc fields. To change a field object into a calc ed field, you right-click on the field ob choose Define Field, check the Calcu check box, and then enter your formula i text box just below the Calculated check

Mr. Pegis's technique is for a form that p vides read-only access to the address infor tion. It relies on the fact that the address information stored in the table is pus down so that empty address lines rise to the top. For instance, the street address i example, "1035 5th Street," is stored in table in address line three, not address one as you might expect. This characteri makes possible the logic shown in Figur which has the effect of floating address toward the top to eliminate blank lines. logic works only if the address lines in table are filled from the bottom up. For reason you'll have to train your users to the street address in line three or use O PAL code to rearrange the data correctly data entry.

You can download the code mentio here from PC Magazine Online. See the bar "Guide to Our Utilities" in this issu Utilities column for instructions.
—*Sal Ricciardi*

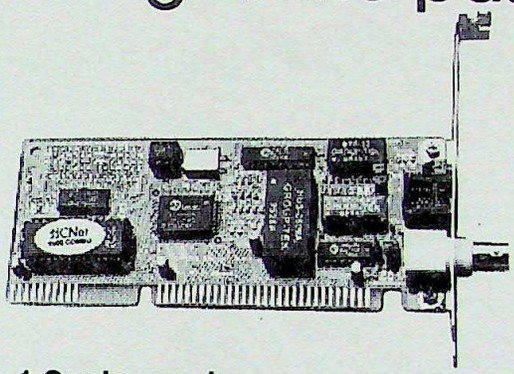
Readers are invited to send their queries regarding PC usage to the Editor, *PC Magazine India*.

Selected queries will be answered in the *PC Solutions* department.

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FAST ETHERNET:
Migration Path Is the Key Issue

Investment protection and hassle-free upgrading from 10Mbps Ethernet.

The majority of LAN users the world over have standardized on 10Mbps Ethernet networks. According to conservative estimates, there are over 40 million 10Mbps Ethernet users in the world, backed and supported by a $ 10.5 billion industry. However, corporate organizations with 10Mbps Ethernet networks are fast realizing the inadequacy of the bandwidth offered by their networks. This is a consequence of several factors including the emergence of graphics-intensive software packages, multimedia applications, and access rights to mobile laptops.

Indeed, high-speed networking has become a necessity and is no longer a choice. Several options are available to those planning to upgrade to high-speed networking. These include Fast Ethernet, 100VG AnyLAN, ATM (asynchronous transfer mode) and FDDI (fiber distributed data interface). The mentioned technologies are all 100Mbps-capable, and have their own characteristic strengths and weak points. ATM and FDDI will remain cost-prohibitive, and therefore, out of the reach of common businesses for some time. The most authentic way of comparing the technologies will be to examine their hold on the market. About 75 vendors are members of the Fast Ethernet alliance, while about 25 vendors participate in the 100VG AnyLAN Forum. It is generally felt that the Ethernet market will have a significant advantage in the future from greater vendor participation and quicker technology development and product delivery. The new 100Mbps Ethernet technology, often referred to as Fast Ethernet, provides a well-defined path of evolution from the 10Mbps network. It can be said to be a continuation from where 10Mbps Ethernet left off. The idea behind the evolution of Fast Ethernet was to increase bandwidth in a 10Mbps Ethernet network to 100Mbps, without disturbing the essential characteristics of the existing technology.

The most clinching factor in Fast Ethernet is perhaps, support for CSMA/CD, which is a media access control method in which workstations "listen" as they transmit data to ensure that no other station has concurrently transmitted data. If a data collision occurs, each transmitting workstation must re-send data until it is successfully received by the destination workstation. A secondary or derived benefit of 100Mbps Ethernet is that data collisions are reduced, because faster transmission speeds reduce the data traffic on the shared Ethernet cable.

CSMA/CD compatibility with existing 10Mbps Ethernet is important as it is easier for the many Ethernet transceiver chip manufacturers to evolve to 100Mbps support. This compatibility has lead to the wide availability of 100Mbps products much earlier than if a new media access control method had to be developed.

100VG AnyLAN is a high-speed LAN technology that boasts an upgrade path for both Ethernet and Token-Ring networks by supporting both data frame types. Like 100Mbps Ethernet, 100VG AnyLAN is compatible with pre-installed 10Base-T cabling, limited to the wire pairs and category type. 100VG AnyLAN is also compatible with 16Mbps Token Ring.

However, 100VG AnyLAN is not compatible with the CSMA/CD specification. It defines a new scheme called demand priority access (DPA)). DPA is a data transmission type where certain critical data types such as real-time video, are given a higher priority. The network is cleared to allow the high priority data to transmit, and low priority data is sent second. This method of transmission between the hub and network device is more efficient than Ethernet's collision detection/transmission method, especially when network load is high.

Fiber distributed data interface was the first 100Mbps LAN technology to become an industry specification. It is utilized most often as a network backbone technology. It has several features suitable for large networks like automatic correction for breaks in the fiber cable. The biggest hurdle to widespread adoption, especially to the desktop, is the cost of installing fiber optic cabling.

ATM is an emerging technology that is currently prohibitive for implementation at the desktop level. One of the key potentials of ATM is that its advantages far outweigh the cost disadvantage.

Because ATM was initially designed as a WAN technology, there have been obstacles in supporting existing Ethernet and Token-Ring LAN traffic. One of the significant advantages of using ATM for both LAN and WAN connections is a major reduction in network management because of the data type consistency across the entire network.

For those interested in upgrading from 10Mbps to 100Mbps, a number of factors exert compelling influence. For instance, the architectural similarities between 10Mbps and Fast Ethernet make the latter a natural choice. Another key consideration for customers in moving from the current network type to the next generation is backward compatibility, ranging from network cabling to software support.

The most fascinating aspect of networking technology in its current status is that, depending upon specific requirements users can select a judicious mix of technologies (rather than a single technology) with the help of devices that perform switching functions. Switching hubs, for instance, divide a network into segments where each segment can be based on a completely different technology. Ethernet switching hubs are like multi-port bridges. Switching technology can support multiple LAN media access and communication technologies. Both 10Mbps Ethernet and Fast Ethernet can reside on the same switching hub, along with 100VG AnyLAN, FDDI and ATM. Switching hubs can range in complexity from simple hubs that handle only Ethernet frames, to complex hubs that read the complete data packet and perform more advanced processing, such as packet filtering and routing.

Here too, for those upgrading from 10Mbps Ethernet, Fast Ethernet offers maximum compatibility and investment protection in terms of savings on cabling. Migration to Fast Ethernet offers advantages, particularly in cases where every user or workgroup requires the highest available bandwidth, and in environments where the user is concerned with protecting dedicated investment while planning for a migration to a high-speed LAN in the future.

Hirendra Chaudhary

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MARKET

Microsoft's Belated Intranet Strategy

Microsoft's commitment to its operating systems and other software products has prevented it from participating actively in the multi-billion dollar Internet market. Others like Netscape Communications Corporation and Sun Microsystems have established an early lead that Microsoft will find difficult to neutralize.

It is probable that the second largest software publisher in the world after IBM Corporation underestimated the potential of the Internet, and was left behind in the race. To make amends for earlier lapses, Microsoft has worked out an ambitious strategy for the rapidly evolving intranet market. An intranet may broadly be described as the integration of a corporate network with the Internet.

According to Microsoft officials, the strategy will enable the company to catch up with the competition. It involves the provision of a comprehensive set of products and services that seamlessly integrate desktops, Lans, client/server applications, legacy systems, and the public Internet to create more effective corporate computing systems. Microsoft also announced a broad set of intranet-related products and previewed technologies in key product areas.

Says Bill Gates, CEO, Microsoft Corporation, "Six months ago, Microsoft promised the world that it was hardcore about the Internet. Since then, we have delivered innovative products in every major product category. Today, we are making the same promise to our customers about the intranet."

Microsoft's intranet strategy is based on four pillars. These are the seamless integration of internal Lans with the Internet; implementation of new navigation paradigms pioneered on the Internet into all products to make it easier for users to find, create, analyze, and collaborate; simplification of application development, deployment, and administration to help customers streamline business processes and shorten development cycles; and integration of new products and Internet technologies with existing infrastructures to enable customers to leverage technology investment and evolve IT systems smoothly. The intranet-related products previewed by Microsoft include Microsoft Office 97, Windows NT 4.0, and Directory Server.

Microsoft is represented in India by New Delhi-based Microsoft India, a wholly-owned subsidiary of the software giant. *(Also read Microland Appointed Microsoft Partner under* Tie-Ups.*)*

Wipro Bags UTI Wan Contract

The Bangalore-based communication and Internet division of Wipro Infotech has bagged a contract from UTI Bank, a private sector bank promoted jointly by the Unit Trust of India, the Life Insurance Corporation, and the General Insurance Corporation. Worth Rs 25 million, the contract is for the creation of a corporate wide area network (Wan) connecting all branches of the bank in different parts of the country with the head office at Mumbai. The network will be based on 64 Kbps leased lines. Wide area networks facilitate inter-connectivity of various branches of an organization spread across a large geographical area. They use leased lines or VSATs to provide access to data on an online basis, and through voice integration. Routers, multiplexers, and other networking products for the Wan will be purchased from Wipro partners Cisco and Micom.

The network will offer 'anytime, anywhere banking'—a service being offered increasingly by private banks to enable account holders to avail all banking services from any branch in the country.

Wipro Infotech was selected to implement the project on a turnkey basis for its expertise in system integration, support, and facilities management.

Says Barun Roy, GM (IT), UTI Bank, "The competition in the banking sector demands that we deliver a very high level of service to the customers while ensuring that the transaction costs are kept to a minimum. Using this network, we will be introducing innovative products and services to our customers involving inter bank transactions, countrywide ATM (automatic teller machine) access and other facilities. In addition, the dedicated voice and fax facilities, and the use of the latest collaborative tools such as Lotus Notes with imaging applications on this network will further improve our internal productivity. Transaction processing will be on-line, and there will be provision for adequate redundancy. In addition, the network will be able to absorb future technologies such as ISDN and ATM (asynchronous transfer mode)."

Digital India Commissions Technology Center

Digital Equipment Corporation has commissioned its technology center for the Asia Pacific Region in Bangalore. Set up at a cost of US $ 2.3 million, the center is connected to Digital's other facilities across Asia Pacific. Customers from India, China, Korea, Australia, New Zealand, Thailand, Malaysia, and Singapore will have access to this center to conduct performance evaluations of their solutions on the AlphaServer platforms.

Digital's database and applications partners Oracle, Informix, Sybase, Computer Associates, Microsoft, PeopleSoft, and so on, will access the center to showcase their solutions to their customers on Digital platforms.

Says Bobby Choonavala, president (Asia Pacific), Digital Asia Pacific, "The opening of the technology center in India is significant, as it enables the demonstration and evaluation of the latest technologies within the Asia Pacific region. Customers will be able to verify that enterprise-wide business solutions offered on Digital platforms provide the best price/performance in the market."

Som Mittal, MD, Digital India, adds, "The establishment of the technology center in Bangalore underscores the importance of the Indian and the Asia Pacific market in Digital's worldwide strategy. It further validates Digital's confidence in the quality and the capabilities of the Indian IT professionals. The technology center follows closely the successful establishment of the India Development center."

The technology center will initially focus on high-end servers, and applications based on leading-edge technologies such as very large memory, very large databases, data warehousing, and high-performance computing. It has an AlphaServer 8400, with 8 Alpha CPU, 8GB of memory, and disk capacity in excess of 320GB.

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IBM Announces Charter for Business Partners

Quite in tune with the company's business partner guidelines for the rest of the world, IBM Corporation has announced a business partner charter for India. The charter confirms that IBM's marketing offensives are based on the active involvement of its business partners.

Henceforth, the entire IBM PC business in India will be carried out through business partners. There will be no direct invoicing to the customers by IBM. Similarly, all desktop software products of the company will be sold through its business partners.

IBM has set up a team of specialists to guide and support its business partners.

Says Paritosh Segal, country manager, channel management, Tata Information Systems (TISL), which is a joint venture between the Tatas and IBM, "We are serious about the business partner program. We are committed to make our business through our business partners. We have taken some concrete steps to demonstrate that commitment. By the Year 2000, 85% of our revenue will come through business partners."

IBM products sold in the country include PCs, RS/6000, AS/400, S/390 systems, and a range of over 2,000 software packages. The product range also includes ATMs, passbook printers, and point of sale (POS) terminals. Recently, IBM introduced its Aptiva home PC in the country. Currently, IBM has 75 business partners in India including solution providers, dealers, and distributors. The partners account for about 20% of the company's revenue generated within the country.

Boom in IT Hardware Industry

The Indian IT hardware industry has been registering a high growth rate, and according to estimates of the Manufacturers' Association for Information Technology (MAIT), it is expected to touch Rs 278 billion by the year 2001. This represents an impressive eight-fold increase from the current Rs 36 billion. According to Gopal Srinivasan, president, MAIT, "PC volume sales are expected to reach 3 million by 2001/2002. Hardware exports are expected to grow to Rs 59.2 billion in 2001/2002 from Rs 7.75 billion in 1995-96. Revenue accruing to the government from the hardware industry will increase to Rs 43.75 billion in 2001/2002 from Rs 73.4 billion in 1995-96.

In view of these positive disclosures, MAIT has recommended a three-prong strategy for the next five years. The strategy asks the government to reduce excise duties, simplify and rationalize import tariffs, and offer higher depreciation as an incentive. It calls for a joint industry-government initiative to promote India as a preferred manufacturing base, and favors streamlining of the electronics hardware technology parks (EHTP) scheme to give a boost to exports.

Ajai Chowdhury, chairman (exports committee), MAIT, says, "Exports are a gauge of national competitiveness and the steady growth in hardware exports is indicative of India's strength in high technology manufacturing. The EHTP scheme needs to be effectively marketed for exports development."

Sustained Growth at NIIT

New Delhi-based NIIT, India's leading IT education and services company, has announced half-yearly financial results. In the six months ended March 31, 1996, the company's turnover grew to Rs 935.8 million, up 59% from the Rs 589.5 million recorded by the company last year. During this time frame, net profits grew to Rs 71 million, up from Rs 21.3 million in the corresponding period in 1994-95.

Announcing the results, Vijay K. Thadani, president and CEO of NIIT, said, "The half-yearly results are an illustration of the commitment of NIIT to maintain its preeminence as the pioneering Indian IT services company." Thadani is confident that the turnover will increase further in the current six months ending September 30, 1996. NIIT recently introduced a set of courses on the Internet and communications called GlobalNet.

Onward Performs Well

Bombay-based Onward Technologies, a software-driven IT company, has touched a turnover of Rs 340 million for the year ended March 1996. The turnover for the year ended March 1995 was Rs 210 million. Operating profits have gone up from Rs 28.9 million to Rs [illegible] million, and profit after tax (PAT) from Rs 20.8 million to Rs 28.2 million.

With these encouraging results, the company has enhanced proposed dividend from 25% (pro-rata) last year to [illegible] this year.

Further, Onward's software development (for export) unit at SEEPZ, marketing office in California, USA, now fully operational. The company received recognition as an in-house R&D unit from the department of scientific industrial research, the government of India.

The company sees the coming year to be very encouraging as all divisions of company—engineering, banking, network integration, multi-vendor customer support services, and value-added distribution have recorded sustained growth.

Advantec to Market Microtest Products

Bombay-based Advantec Networking Systems has tied up with Microtest, USA, to market in India its range of diagnostic and testing products for networks. Microtest provides network cable management, and diagnostic and connectivity products, and manufactures UTP, coaxial, and fiber test equipment.

Microtest has several popular products in the market. Pentascanner, with two-way injector, is a cable tester for CAT 5 testing and certification. Compas is a tool for large networks. It assists in connectivity tests between working computers in Novell NetWare and TCP/IP LANs. The lower speed CAT 3 & 4 (20 MHz) MT350 Scanner is a cable tester for both Token Ring and Ethernet applications.

MIPS to Market VB Compress Pro

MIPS India has tied up with WinWare of USA to distribute Visual Basic (VB) Compress Pro, an optimization and compression tool for serious VB Developers. VB Compress Pro is a unique analysis and optimization tool which allows VB programmers to write, maintain and maintain their code better. Its advanced features bring a new level of sophistication to VB optimization, debugging and project management.

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TIE-UPS

Ex Machina Ties up With Motorola

Ex Machina, a leading developer of wireless communications software solutions for paging and digital cellular networks, has tied up with the Messaging Systems Product Group (MSPG) of Motorola. The agreement will enable Ex Machina to use Motorola's Flex chip set in its AirMedia Live information service, which is scheduled to go on the air by the end of July 1996. AirMedia Live is a wireless, Internet-based news, entertainment, and messaging network, which transforms the desktop PC into an independent messaging center. The network is designed to extend the benefits of the online world to home and small business users through real-time wireless alerts and notifications of e-mail, news, sports, and financial information.

Motorola's Flex protocol is the *de facto* global standard in high-speed paging solutions, having been adopted by 7 out of 10 of the world's largest paging markets. Flex technology was developed to allow service providers to expand beyond their current system capacity limitations, and to lay the platform for advanced messaging.

Says Dr Percy Batlivala, executive director, India Paging, "Incorporating Flex paging protocol technology in a chip set has opened a market in which computers, communicators, household appliances, and electronic devices may receive information and be controlled remotely. The Flex chip set is a vehicle to implement Motorola's vision for an open and revolutionary wireless messaging environment."

Crystal Ties up With Rockwell

Crystal, a wholly-owned subsidiary of Seagate Technology, and Rockwell Switching Systems Division (SSD) have announced a strategic partnership for the development of management information software for call centers and the business enterprise.

Using key technologies in Crystal's new three-tier reporting system, Crystal Info, including powerful scheduling, security, information sharing and smart processing, Rockwell's newest reporting software Total Recall Reports provides timely, secure, and open access to information throughout the enterprise. Total Recall Reports allows users to access call center data stored in Rockwell's open data repository, InfoServer. In addition, with Total Recall Reports and Crystal Info, other open database connectivity points can be accessed to create custom reports for specific enterprise information needs.

Says Kelly Burke, product manager (Total Recall), Rockwell, "Our reporting software sets new standards in helping organizations make better business decisions by getting the right information to the right people enterprise-wide, in the most usable format. We did a thorough comparison of all the business intelligence and decision support tools on the market. Crystal Info came out the leader in its ability to meet the needs of our information users."

US-based Rockwell is a $ 13 billion diversified, high-technology company holding leadership market positions in automation, avionics, semiconductor systems, aerospace, defense electronics, and automotive component systems.

Mindware Is NEC's Partner

NEC Corporation of Japan has selected Mindware, the software division of Pertech Computers (PCL), as one of its long-term partners in software development.

Mindware has set up a dedicated software development center for NEC in New Delhi. The center will develop operational management middleware for NEC's third computers and communications unit.

Mindware is also currently involved in other NEC projects involving reengineering, porting, CAD system conversion, groupware development, and the development of medical and educational systems. A number of dedicated software development centers for the different divisions of NEC are expected to be created by Mindware, which has a total order booking from NEC to the tune of $ 5 million for 1996 and 1997. The $ 43.3 billion NEC corporation is part of the Sumitomo group, which specializes in electronics, communications systems, and computers.

Microland Appointed Microsoft Partner

Bangalore-based Microland, a leading networking and communications solutions and services provider, has been appointed by Microsoft Corporation as a strategic partner for system integration services. Microsoft and Microland will work closely to deliver a wide range of services to corporate customers in India for integration, migration, network management, outsourcing, training, service, and support.



Rajiv Nair

Says Rajiv Nair, MD, Microsoft India, "As Indian corporate organizations strive towards excellence amidst global competition, they require a new paradigm. With its diverse technologies and global leadership, Microsoft has been in the forefront of the movement towards enterprise computing. We believe that Microland represents the essence of the kind of partners corporate organizations require to fuel this quest, and we are very excited about our relationship."

Pradeep Kar, CMD, Microland, adds, "Our goal is to enhance business benefits that customers expect when we integrate and set up networks. Microsoft's Windows NT and BackOffice products are the right set of tools for delivering effective enterprise-wide computing solutions. Microsoft is the world leader in such enabling technologies, and this relationship will result in concrete benefits to our customers."

Microland is a pioneer in the networking field. It has alliances with a large number of networking product and solution manufacturers. Its Internet division has a tie-up with Netscape Communications Corporation.

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Novell Defines Upgrade Path to Proliant Servers

Novell has announced the optimization and integration of its NetWare 4.1, NetWare 4.1 symmetrical multiprocessing (SMP), and ManageWise software products with Compaq Computer Corporation's new ProLiant 5000 servers based on the Intel Pentium Pro processor. Novell completed the integration, optimization, and testing work as part of the Pacesetter '96 program sponsored by Compaq and Intel. The resulting enterprise network software provides Novell customers with a clear upgrade path to the ProLiant 5000 server family and Pentium Pro technology.

The integration of Novell network software with Compaq's ProLiant 5000 servers combines the technological leadership of two proven industry leaders and provides customers an industry-standard solution that delivers the performance, reliability, and scalability of more costly proprietary systems at about one-half of the cost. Novell tuned its NetWare 4.1 and NetWare 4.1 SMP software to provide users with full access to the high-performance Pentium Pro processors in each ProLiant 5000 server.

"Novell and Compaq share the vision of bringing the best-of-breed distributed networking solutions to our customers worldwide. The combination of Compaq's ProLiant 5000 servers and NetWare 4 symmetrical multiprocessing provides customers with a powerful and scalable network platform that can be expanded in cost-effective increments as the network grows," says Steve Markman, executive VP and GM, Novell products group.

Adds Gary Stimac, senior VP and GM, Compaq systems division, "Compaq and Novell enterprise solutions open the door for managed, comprehensive, new distributed networking applications required to remain competitive in today's fast changing business environment. Together with Novell, we are offering scalable, high-performance, highly available solutions for deploying next generation client-network systems on industry standard platforms."

With an installed base of over 500 million users, Novell's NetWare network operating system is today's leading PC platform for network solutions. Users can create advanced networking solutions by leveraging Novell network services, such as Novell Directory Services, to simplify the creation of distributed enterprise networks. The scalable power of NetWare SMP builds on this NetWare platform to meet enterprise needs for critical network services such as database management, messaging, Internet access, and intranet services. With the addition of Novell's NetWare Web Server and InnerWeb Publisher to the Compaq-Novell solution, customers can readily adapt their Lans and Wans to intranets supporting the heaviest user traffic. These networks benefit from the inclusion of ManageWise, the leading heterogeneous PC network management suite, to provide end-to-end network administration.

Compaq and Novell have been working together since 1983 to address the evolving needs of network computing customers. Through the enterprise computing partnership, Compaq and Novell are helping companies migrate business-critical applications to industry-standard solutions, and simplify the integration, operation, and maintenance of networked computing environments.

Indal Selects Oracle ERP Software

Calcutta-based Indian Aluminium Company Limited (Indal) is implementing a world-class enterprise-wide resource planning (ERP) package to cater to the changing needs of its domestic and overseas customers, and to optimise resource utilisation. The company has selected Oracle GEMMS and Oracle Financials to be implemented across the Indal enterprise network.

Major selection criteria for the software packages were ability to address the process manufacturing requirements of the alumina and aluminium businesses, and availability of support and services in India for speedy implementation.

Tapan Mitra, MD, Indal, says, "We are confident that this will enable Indal's businesses to serve our present and future customers better, bring in more discipline into our working, and strengthen employee involvement."

Anil Kaul, CMD, Oracle Software India, comments, "This is about real people in real facilities working on real solutions for real clients. We are proud to be associated with this important project at Indal."

Indal is an associate company of A... Aluminium, Canada. With a turno... nearly Rs 11 billion, it is a fully inte... aluminium company with operations ... ing from bauxite mining, alumina ... ing, aluminium smelting, to value-add... semi-fabricated products of sheet, ... and extrusions. The company has 14 p... and 10 offices in India.

With a revenue of approximately ... billion, Oracle Corporation, USA, ... world's leading supplier of software ... information management and the wo... third largest software company after I... and Microsoft. The company offers ... database, tools, and application prod... along with related consulting, educa... and support services in more than ... countries around the world.

New Delhi-based Oracle Software ... dia is a subsidiary of Oracle Corpora... USA. It markets the complete range ... Oracle products and services through ... offices in Delhi, Mumbai, Bangal... Calcutta, and Madras. Oracle Softw... India has established a national supp... center at Bangalore to support its cus... ers under the technical support serv... programme.

Widecom to Develop Engineering SW

Noida-based Imaging Software (I... has set up a 100% export-oriented ... at Noida Export Processing Zone ... collaboration with the WideCom group ... Canada. The unit will develop high-... engineering software for wide-format ... ument handling systems.

Says R. Tuli, MD ISL, "Presently, I... is engaged in development of projects ... Internet, Widefax-on-demand, Wide... imaging package, document manag... systems, and imaging software." The ... software product are being developed ... future market requirements. For exam... Widefax-on-demand will enable the c... er to access any drawing from any part ... the globe. The Wideview imaging pa... age will enable the user to perform var... image-processing operations onto an ... age. The document management syste... an intutive tool to retrieve and store ... in a non-conventional manner.

The project has an installed capa... of 14,000 packages per annum. The ... has commenced production.

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Nokia to Provide GSM Equipment to 3 States

BPL US West Cellular Telecommunications Services and Nokia Telecommunications, the infrastructure arm of the Finland-based Nokia group, have signed wide-ranging agreements for the supply of GSM equipment and services to Tamil Nadu, Maharashtra, and Kerala.

Nokia will deliver a turnkey GSM network to Tamil Nadu, including Nokia DX200 mobile switching, base stations and base station controllers, a network management system, short message service, voice mail, microwave radios, and subscribertransmission equipment. The agreements also call for the supply of Nokia DX200 mobile switching centers to BPL US West's networks in the states of Maharashtra and Kerala. The three mentioned states are scheduled to launch GSM services during the fourth quarter of 1996.

Turnkey services will be provided by Nokia for the entire Tamil Nadu networks, as well as for the Nokia DX200 mobile switches in the Maharashtra and Kerala networks. Nokia will also provide comprehensive training, long-term technical and software support, and round-the-clock help-desk services.

BPL US West, a joint venture between BPL and US West, has bagged 10-year licenses to run GSM networks in the mentioned states. The US $ 8.4 billion Nokia group has similar arrangements for the supply of equipment and services with Modi Telstra's Calcutta GSM network, SKYCell's Madras GSM network, Fascel's Gujarat State GSM network, and Tata Communications' Andhra Pradesh state GSM network.

Ericsson, Cisco in Remote Internet Access Tie-Up

Ericsson, the North European communications equipment giant, and Cisco Systems, the world leader in internetworking products, have decided to collaborate on the development and exploration of wireless Internet services. Wireless data communication enables network operators to deploy and offer new services, such as e-mail, based on wireless implementations of remote Lan access, intranet access for internal corporate communications, as well as global Internet access.

The results of these efforts are intended to be deployed through several standard wireless implementations including GSM 900, DCS 1800, and PCS 1900.

The surge in Internet usage, the unprecedented growth in the portable PC market in conjunction with PC cards promoted by PCMCIA, and the popularity of digital mobile phones are the principal motive forces driving wireless data communication. Smartphones and personal digital assistants will further increase the pace of development in this segment. The tie-up between Ericsson and Cisco Systems will enable wireless operators to meet these demands.

The main aim of the tie-up is to provide solutions for end-to-end digital connections and fast call opportunities for wireless circuit-switched data services. Typical operator service offerings will include direct Internet access with TCP/IP connectivity.

Ericsson has supplied GSM systems to 44 countries, and is a world leader in GSM equipment. The company is participating in the telecommunication revolution in India. It sacrificed a contract in Pakistan to safeguard its business interests in India.

TRR Software to Market B&H Image Scanners

TRR Software, a leading manufacturer of optical mark reader (OMR) in India, has been appointed as value-added reseller of Chicago-based Bell & Howell image scanners in India.

Bell & Howell (B&H) scanners are high-end, heavy-duty and robust devices. TRR Software will offer the full B&H scanner range comprising seven models. All the seven B&H scanners offer speed ranging from 36 to 72 pages per minute (ppm), and are available with semi-automatic or fully automatic document feed (ADF) tray with 200-500 pages capacity.

B&H scanners can scan documents of size 2.5" x 3.5" to 11.8" x 17", of varying thickness (from onion skin bills to business card sheaths). ADF adjusts to varying thicknesses to scan without any jam.

The most impressive feature of the scanner range is adaptive contrast enhancement (ACE) for improved readability and clarity. This is the second generation of a dynamic, two-dimensional adaptive thresholder that has three primary modes: Text, Photo, and Mixed. ACE automatically adjusts the contrast on individual documents without any operator intervention. And because of the way ACE converts gray-scale pixel output to binary format, in most cases, the quality of the scanned text is better than the original. Text information is separated from background distortions and texture. The speckles are removed for more efficient binary compression. The scanners also offer intelligent half-tones in photo mode to minimize the file size.

B&H scanners support a host of image compression/interface cards that come with many optical character recognition (OCR) packages, depending on user needs and the application used.

Solutions for imaging, retrieval with barcode reading, and OCR conversion/application are readily available from TRR Software. Due to the high quality output from the scanner, the conversion rate is very high.

Some specific applications of B&H scanners are office, inter-office communication/letters, dividend warrants, share applications, share transfer applications, and examination processing. Highly sensitive and confidential documents can be imaged and retrieved for future reference, avoiding frequent handling of such sensitive documents. This is also used for cheque processing and reconciliation of dividend/interest warrants.

Globus in India

Baroda-based DDE ORG Systems (DDE ORG), an Indo-Danish joint venture, has signed an agreement with Temenos Systems of Switzerland to jointly develop the Indian banking market. Says George Koukis, chairman, Temenos Systems, "DDE ORG's approach to business is similar to ours and their understanding of the banking and IT industry is extremely high, a combination of skills we can work with."

DDE ORG, known for its IT solutions, has already developed a package for retail banking and trade finance for Indian banks. The banks using this package include State Bank of India, Punjab & Sind Bank, and Baroda People's Co-operative Bank.

Temenos Systems markets the international banking solution Globus. It is a US $ 27 million company with more than 65 clients.

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IN BRIEF

Sun Shelves Investment Plans

Sun Microsystems has shelved its plan for setting up a wholly-owned subsidiary in India. The company had announced in August 1995 that it will invest in an Indian subsidiary. In April 1996, Sun officials had confirmed that the subsidiary will be created within four months of the general elections being over.

The decision to shelve the project was prompted in all probability by the rout of the Congress and the installation of the Janata Dal-led United Front government at the center.

The decision to postpone the setting up of a subsidiary has evoked spontaneous reactions in the India liaison office. While Anal K. Jain, country manager, resigned his post in disgust, other senior employees are planning to quit at the earliest possibility.

Lionel Lim, MD (Asia South), Sun Microsystems, said, "I have found no reason to set up a subsidiary. Right now, our focus is on increasing our profile and coverage. Neither of these hinge on having a subsidiary as of today." At the departure of Mr Jain, Lim commented, "Sun is not very people-dependent. Even if I leave, Sun will not collapse."

Aptech in Communication Education

Hardcore, the networking and telecommunications training division of Aptech, has launched Axis, a two-year integrated communications course.

Hardcore will start foundation courses for non-technical students. The first year courses will cover computer technologies, Internet, multiple operating system environments, voice and telecommunications, and Novell's network management curriculum leading to CNE certification. In the second year, the focus will be on internetworking across diverse platforms, a detailed coverage of advanced telecommunication technologies including ATM and ISDN, an overview of value-added services, and a specialized module on building intranets and Internet.

PSI Assignment for Nepal Electricity Authority

Bangalore-based PSI Data Systems has created a computerized billing system for Nepal Electricity Authority. Funded by the World Bank, the US $ 165,000 project guarantees automation of billing operations such as meter reading, bill printing, cash collection, and management information reports. The system has been implemented in Kathmandu, and is scheduled to be extended to 40 sites over Nepal in the coming months. The contract was bagged by PSI Data Systems as it offered a complete solution including hardware and software.

PSI Data Systems is an affiliate of [illegible] SA of France. It specializes in custom engineered software solutions, system integration and consulting.

The company recorded a turnover of Rs 210 million in 1995-96, and is expected to cross Rs 280 million in the current year.

AWARDS/APPOINTMENTS

UB Networks

The GeoRim/E Ethernet switch of UB Networks has won the Networks as Advertized award instituted by Mier Communications. For the award, products from different vendors were evaluated with the same criteria used by network managers when faced with buying decisions. The testing methodology includes installation and configuration, ease of use, functionality, and performance.

Says Ed Mier, president, Mier Communications, "This award is presented to vendors only for products that are proven to perform as advertized, and we at Mier Communications can independently attest that the product does what it is intended to do, and that it is a good buy."

UB Networks' GeoRim/E is a versatile Ethernet workgroup switch. It delivers backbone level features and performance at workgroup price.

Mier Communications is a network consultancy and test center that conducts usability and performance testing of networking hardware and software products. UB Networks is a pioneer in distributed network management solutions.

Novell

Novell products have won the 1996 LAN Times Readers' Choice awards in five categories. The products to win the coveted award include GroupWise, ManageWise, NetWare, and SoftSolutions.

Novell's NetWare won the network operating system category award for a record sixth time in a row, with a 67% mandate. The groupware and LAN management software awards went to GroupWise and ManageWise respectively. GroupWise also won the e-mail category award, replacing cc: Mail.

Says Susan Briedenbach, editorial director, LAN Times, "Many industry awards are based on the opinions of indsutry gurus or the results of laboratory testing, but a LAN Times Readers' Choice reflects the actual utility of products in real-world settings. Novell is to be recommended for providing the preferred solution in five different categories—the most of any vendor this year.

Xircom

Steven Ho has joined Xircom Asia Pacific as director, sales & marketing. Steven will be responsible for the overall sales and marketing activities of the company in the Asia Pacific region, including Japan, Australia, and New Zealand.



Steven Ho.

Immediately after joining Xircom, Steven said, "I am very pleased to be part of such an exciting and growing company. The combination of Xircom's first class mobile connectivity products and the Asia Pacific region's high growth potential allow for some exciting opportunities ahead."

Before joining Xircom, Steven was regional sales manager, Cabletron Systems. He has also worked as major accounts manager, Digital Equipment Corporation, and sales manager (networks division), CSA Automated Systems.

Integra TechSoft

Bangalore-based Integra TechSoft has appointed Chandra Sekaran as the head of its finance division. Chandra Sekaran will be responsible for building the company's financial information systems. He will also create global pricing models for Integra's software packages.



Chandra Sekaran.

Chandra Sekaran has [illegible] 12 years of experience in finance, taxation, accounts and MIS system design.

Integra TechSoft is co-promoted by Integra Technology International of the US.

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IT SHOWS

Exhibition/Fair	Brief description	Date	Venue	Contact
BUSINESS TO BUSINESS '96	Show on office products and services, including computer hardware and software, and communications.	21-24 Aug. '96 18-21 Dec. '96	Ahmedabad Bombay	The Assistant Manager— Coordination Conventions & Fair India 157 Princess Street Bombay 400 002 Tel: 2060808; Fax: 2080171
VLDB '96 (Very Large Database Conference)	An international conference on very large database management. Topics include database engineering, data warehousing, implementation techniques, distributed and client/server databases, hypermedia and object-oriented databases, and so on.	3-6 Sept. '96	Bombay	P. Sadanandan NCST, 6th Floor, Major Tower Visvesvaraya Centre Dr Ambedkar Road Bangalore 560 001 Tel: 91(80) 226 3100 Fax: 91(80) 226 1531
IT '96	An IT show targeting computer users. IT manufacturers and service providers will display their wares. Business opportunities can be explored.	Oct. 30- 3 Nov. '96	Bangalore	M. Dayanand 401, 4th Floor, M.B.C. 134 Infantry Road Bangalore 560 001 Tel: 5511511; Fax: 5562971
COMDEX/FALL '96	A major platform for buyers, sellers, and decision-makers. On display will be the latest in products and services, including computer hardware and software, multimedia, networking solutions, communications, Internet, education and training programs, computer-telephony integration, mobile and wireless computing, and ISDN-related hardware and software.	18-22 Nov. '96	Las Vegas	Business India Exhibitions Wadia Building, 17/19 Dalal Street Bombay 400 001 Tel: 2663449/1425 Fax: 2664364/2041974
INFOCOM '96	An exhibition of computer, communication, networking, and telecom products and services for banking, business, and corporate sectors.	19-22 Nov. '96	World Trade Center Bombay	The Organiser Infocom '96 Exhibition 4A Naaz Building, Lamington Road Bombay 400 004 Tel: 3860436/3851781 Fax: 3874915/6260478
COMPONEX '96	A conference and exhibition of electronic components, materials, and production equipment.	25-28 Nov. '96	World Trade Center Bombay	Electronics Today A4 Naaz Building, Lamington Road Bombay 400 004 Tel: 3860436/3851781 Fax: 3874915
COMDEX ASIA '96	The number one IT industry show of the country with active participation of IT delegations from the US, Europe, and South East Asia.	6-9 Dec. '96	Pragati Maidan New Delhi	MAIT, PHD House, 4th Floor Opp. Asian Village New Delhi 110 016 Tel: 6855487; Fax: 685 1321
TELECOMMUNICATIONS '96	An IT exhibition on communications products and technologies. Good platform for forging commercial and business alliances.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647688 Fax: 4633506/4648692
BROADCAST CABLE & SATELLITE INDIA '96	A major international exhibition and conference on professional camera, lighting, sound, movie and video production, post-production products, radio and TV broadcasting, and cable and satellite systems.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647688 Fax: 4633506/4648692

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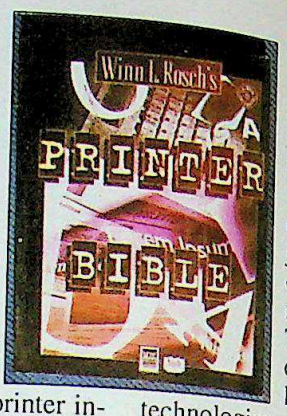
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Printer Bible

By Winn L. Rosch

BPB Publications, B14 Connaught Place, New Delhi 110001.

Price: Rs 375; Pages: 640



Most PC users ignore the printer as a necessary appendage and concentrate on application software instead. From the perspective of using the PC, the printer deserves more attention for the simple reason that in an overwhelming 95% cases, output is required in the printed hard copy mode. It is therefore advisable that PC users take time off their busy schedules to pick up the rudiments of printer care and maintenance.

The composition of the printer market is changing fast. Dot matrix printers are being relegated to the dump and ink-jet printers incorporating better technology are coming to the fore. High-quality laser printers are capturing the market for high-end professional printing. These changes are taking place not merely because the new technologies offer better quality printing, but also because they are becoming more competitive on the price front. Portable printers are flooding the market, and you will be amazed at the power and versatility of some of the portable printer models.

Printer Bible will be an asset to all those who wish to acquaint themselves with the fundamentals of printing technology, the functioning of different types of printers, and basic printer problems that can be set right without the intervention of an expert. The chapter on printer installation discusses how the printer should be connected to the PC. For those intending to buy a printer, this book provides practical advice. It is always better to select the right solution after examining exact requirements than to go by the advertisement hypes of available brands.

Printer is a lot more mere specific discusses pr technologies cluding lectr jargon on color, con mables, and There are sepa chapters on languages, technologies, and printer dent fonts.

Of equal interest to re will be the sections on PC-p er communication and se parallel, and network co tions.

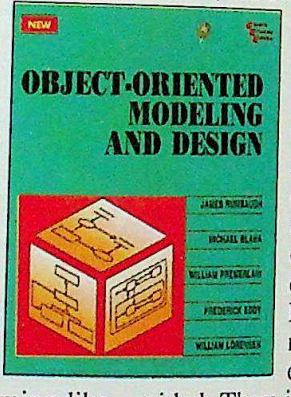
An added attraction is CD-ROM disk containing help files, and printer utili

Object-Oriented Modeling and Design

By James Rambaugh, Michael Blaha, William Premerlani, Frederick Eddy, William Lorensen

Prentice Hall of India, M97 Connaught Circus, New Delhi 110001.

Price: Rs 175 (Indian Reprint) Rs 2,244 (Original US Edition) Pages: 500



Object-Oriented Modeling and Design is nothing less than a masterpiece. The authors can be said to have impeccable credentials, as they belong to the General Electric R&D Center in New York. The book is simply a must for all those evenly remotely associated with programming, particularly object-oriented programming. The secret of its appeal is a completely objective approach, which is a welcome break from the overtly commercial overtones of most books in this genre. The emphasis is on building a strong and invincible conceptual framework rather than on hackneyed programming exercises. Aspects pertaining to design and analysis have been given more weightage than actual programming.

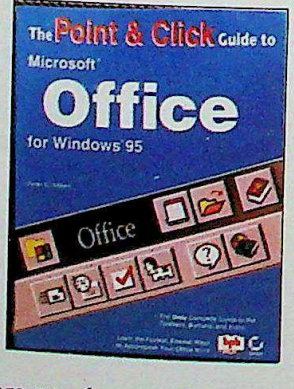
The Object-oriented approach is examined from a large number of perspectives including modeling, design, analysis, functioning, and implementation. Crucial advantages of object-oriented programming like reusability and extensibility are dealt with in detail. Object-oriented languages like Sma Eiffel, and C++ are first disc separately. then compare non object-or ed langua There is a sur section on conc er animation another on el cal distrib design syste Bibliograp notes and refe es have been p vided. There is a summary exercises at the end of each ter.

The Point & Click Guide to Microsoft Office for Windows 95

By Peter G. Aitken

BPB Publications, B14 Connaught Place, New Delhi 110001.

Price: Rs 150; Pages: 408



This is a tutorial guide to Microsoft Office for Windows 95, an application suite including Word for Windows 95 (a wordprocessor), Excel for Windows 95 (a spreadsheet), and PowerPoint (a presentation program). The applications in the suite are complete packages and can be used independently. In Microsoft Office for Windows 95, the packages have been rewritten for the 32-bit Windows 95 environment.

In view of the fact that Windows 95 has failed to click in India, it is doubtful that the Windows 95 version of the Office suite will be popular, all its advantages notwithstanding. An independent survey conducted in the country has indicated that Microsoft Office is less popular than its Lotus counterpart Lotus SmartSuite. However, the findings of the survey are suspect, and experts are unanimous that Microsoft's broad Windows base has ensured the unqualified success in India of the Office suite.

More people are using the individual applications in the suite rather than the entire suite. In addition, Windows 3.1 and Windows for Workgroups 3.11 will continue to be the overwhelming choice of corporate users.

The Point & Click Guide to Microsoft Office for Windows 95 is written in a matter-of-fact style. It deals with features, commands, and operational pro dures in the three mentio packages. The three packa have been handled separat though the real advantages installing the entire suite c have been highlighted more phatically.

The book reads like an personal help manual. If the er is not averse to looking electronic help provided in applications, this book is co pletely redundant. After all we really need to obtain ad tional information from a s ondary source, when a lot of tical information is available electronic help files, waiting be tapped at the click of the button? The mature guidance book must provide to justify itself is not very conspicuous

—Hirendra Chan

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BILL GATES COLUMN

BIOTECHNOLOGY, LIKE SOFTWARE, WILL CHANGE THE WORLD

sometimes people ask me what field I'd be if I were not in computers.

I think I'd be working in biotechnology. I expect to see breathtaking advances in medicine over the next two decades, and biotechnology researchers and companies will be at the center of that progress.

I'm a big believer in information technology and the way it is revolutionizing how people work, play, and learn. But it's hard to argue that the emerging medical revolution, spearheaded by the biotechnology industry, is any less important to the future of humankind.

It, too, will empower people and raise the standard of living.

Researchers are expanding our knowledge of how the body works at the most fundamental level, and this knowledge is giving us a deeper understanding or diseases and how to treat them.

When people hear the term biotechnology, they often think of gene-splicing and other forms of genetic engineering. This is an important branch of the science, but it's not the most critical part.

The biggest breakthrough in medicine will result from the mapping and understanding of the human genome—figuring out the exact sequence of the 3 billion nucleotides that make up the estimated 100,000 genes that are the collective blueprint for human beings. It's an immense job.

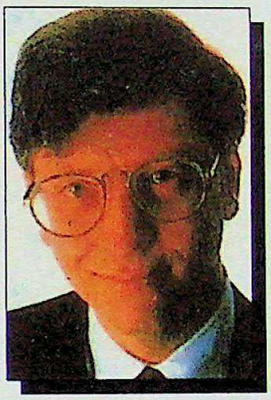
If scientists were to identify the exact location of one tiny piece of genetic information per second, 24 hours a day, everyday, it would take a century to map all 3 billion of them. Thanks to computers and specialized technology, researchers around the world are working at a much faster collective pace than that, and the project could be complete in as little as a decade from now.

So far the man shows most of the main features of the genuine and great detail about selective parts of it. To use a survey of Earth as an analogy, so far we've established the location of most countries and quite a few big cities, and we've made detailed maps of many important neighborhoods.

This research is a key to dealing with disease.

A disease for which there is no effective therapy is an unsolved mystery. Medical researchers need clues about how to devise an effective drug or therapy for the disease. What they need is a break in the case, a strong piece of evidence that can start them in the right direction.

One of the most promising ways to find this kind of clue is to compare in painstaking detail the genetic makeup of related people, some of whom have a disease that runs in the family and some of whom do not. The goal of this detective work is to find a mutant gene—one that has some of its genetic information scrambled—in the people who are afflicted.



> *"I'm a big believer in information technology and the way it is revolutionizing how people work, play, and learn. But it's hard to argue that the emerging medical revolution, spearheaded by the biotechnology industry, is any less important to the future of humankind."*

Once a gene is associated with a disease, it can be used to find ways to interfere with the disease. If a drug or other therapy is found to treat people who have a genetic predisposition for the disease, it may well work for everybody else too.

I think we'll eventually devise therapies for most diseases, an achievement that would improve almost everybody's life at one point or another. It will take many decades, perhaps even several lifetimes, to reach this goal but every advance along the way is extremely worthwhile.

Biotechnology is not my line of work, but I enjoy following the progress as a hobby. I helped finance a molecular biology program at the University of Washington, and I sit on the boards of ICOS Corp. and Darwin Molecular Corp., both small privately held biotechnology companies.

(Although there are lots of great companies in the field, anyone contemplating investing should understand that it's hard to pick the winners from the losers, so it's very risky.)

One reason I'm attracted to the biotechnology industry is that it takes such good advantage of information technology. Computers are a fundamental tool for searching the genome to find patterns that match, modeling complex systems and communicating with other researchers.

Researchers mapping the genome. in countries around the world, use electronic mail to share ideas. They put their results up on the Internet and search for detailed information on the work of others. Darwin, for instance, has built a state-of-the-art intranet to assist its researchers in navigating the phenomenal network of gene data that's available, both inside and outside the company.

With the aid of the Internet and other modern information tools, it took only eight months for a team that included Darwin scientists to discover a gene defect that can lead to premature aging. Researchers plowed through 650,000 nucleotides until they found a mutant gene to blame for Werner's Syndrome, which causes 40-year-olds to look like—and have the infirmities of—80-year-olds.

If it weren't for the Internet, this discovery might still be years away. Not only did the Internet allow for messages to be sent between the researchers at several sites, but it also allowed international databases of genetic information to be searched in a matter of minutes, instead of in days at a physical library.

It's exciting to see computer and communication technologies used so effectively and to such good purpose. Even if PCs and the Internet did nothing but advance medical research, all of the investment that we have made in these information tools would be well worthwhile.

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Questions may be sent to Bill Gates by e-mail. The address is askbill (AT) microsoft.com.

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EVERYBODY'S TALKING

DEATH OF THE HTML CODER

By Dewang Mehta

It seems like you can't walk into a book store any more without being overwhelmed by the number of books promising to teach you the art of authoring Hyper Text Markup Language, better known as HTML. Each month brings a truckload of new titles discussing the basic Web, and with companies seemingly stampeding for presence in cyberspace, a whole new job market has emerged--one that requires workers competent in HTML page creation.

Such Webmasters display an almost snobbish pride when they announce to peers that they have mastered this "mystic" communication language. They hop with joy as new HTML extensions are added to their design arsenals. Some even call themselves real programmers because they understand how to apply HTML tags to text and graphics to enhance the message of a web site. To all those Webmasters who believe that they have job security in knowing the meanings of <B> and </B>, take notice—your days are numbered.

Early adopters and explorers of this page description language used in the print and desktop publishing industries took great pride in understanding and mastering the art of Postscript code. Adobe published the now famous "Blue Book" of Postscript commands, akin to the early HTML command books.

Eventually, computer-book publishers followed suit by releasing enhanced editions of the instructions on the Postscript Language, ranging from short 100-page manuals to bulky 2,000-page requiems.

As time progressed, software developers created desktop publishing applications that generated Postscript code automatically, thereby eliminating the need for designers to know the intimate details of Postscript commands. Companies such as Quark, Aldus and, of course, Adobe then became synonymous with desktop publishing, thanks to their ability to remove the requirement for Postscript.

With that, programs such as QuarkXPress, PageMaker, Illustrator, and Photoshop took page design from the Postscript coders and placed it back into the hands of the graphic artists. The same thing is happening with HTML programming. Netscape recently released their Navigator Gold product with basic WYSIWYG design tools. Not to be outdone, Microsoft bought Vermeer Technology and its premier Front Page software for about $130 million. The buzz among designers is that Front Page can easily be developed into the QuarkXPress of the Internet. Even Adobe has re-engineered their page layout software technology with their PageMill package. Many new companies are bringing out their own interpretation of a Web-supported page layout utility that eliminates much of the need for print media.



> *You'll have to learn how to program a computer, if you wish to avoid being replaced by a programmer.*

To all the smug HTML authors laboring under the false delusion that their vocation is going to stay in demand: Get a grip and learn a real Net programming language like C++ and Java. Web content providers are fast realizing that they can purchase software packages and leave design to talented graphic artists. HTML coders will join the ranks of punch-tape operators.

To succeed, former HTML coders will need to assimilate strong graphic arts and page design skills or become specialists in highly sought-after object-oriented programming, of which C++ and Java are family members. At the very least, they should learn a macro language such as VBScript to stay viable in the Internet marketplace--long enough to comprehend the higher level computer programming dialects.

In other words, you'll have to learn [illegible] to program a computer, if you wish to [illegible] being replaced by a programmer.

If there is bad news for HTML [illegible] there is some good news for net surfers [illegible] wish to do some hassle-free multim[illegible] browsing, thanks to the new version[illegible] Netscape Navigator and Microsoft's Inte[illegible] Explorer. Both Netscape and Microsoft [illegible] announced new releases addressing [illegible] highlighted by users. Support for real-[illegible] audio, video clips, and 3D browsing—[illegible] dard features of Navigator and Exp[illegible] now—will hopefully encourage Web [illegible] creator to include more diverse multim[illegible] content.

Version 3 of Netscape Navigator [illegible] built-in sound and video features. This m[illegible] you need not configure helper program[illegible] watch video clips, play sound samples [illegible] explore 3D virtual reality worlds. LiveA[illegible] enables you to listen to audio tracks, so[illegible] effects, music, and voice on a Web p[illegible] LiveVideo enables you to view AVI form[illegible] movies using frame-by-frame move[illegible] buttons. Apple QuickTime movies can [illegible] be played in Netscape without having [illegible] launch a separate player program.

Live3D enables you to view 3D anim[illegible] ed scenes using an integrated VRML (V[illegible] al Reality Modeling Language) viewer. [illegible] can drag your pointer within 3D scenes [illegible] interact with text, images animation, so[illegible] music, and video.

Other innovations in Navigator 3.0 [illegible] aimed at the growing corporate intranet m[illegible] ket, with built-in telephony using CoolT[illegible] which offer high-quality audio conferenc[illegible] a phone book and answering machine. T[illegible] are also Secure Socket Layers (SSL) 3 se[illegible] rity, personal identification using digital [illegible] tificates, and the Netscape Administra[illegible] Kit for customized installation of Navig[illegible] 3 on corporate networks.

Meanwhile, Internet Explorer, which [illegible] ready had support for displaying in-line [illegible] eo and playing audio files, will soon inc[illegible] support for frames. Microsoft claims its [illegible] plementation of the window-within-a-w[illegible] page system is an improvement [illegible] Netscape's, because it enables you to in[illegible] porate customized borders and floating fr[illegible] that the user can drag and drop anywhere [illegible] the screen. Happy net surfing through [illegible] multimedia browsers!□

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Abort, Retry, Fail?

THE LIGHTER SIDE OF PERSONAL COMPUTING

By Don Willmott

Beeper Bleeper

Contributing editor Bruce Brown finds that his pager gets confused by interference at PC Labs. The day after the New Hampshire primary, this garbled news report was displayed on his pager's LCD screen: "Primary victor Pat Buchanan and losers Bob Dole and Lamar Alexander are vowing a bloody fight.... Dole and Alexander are each calling the other people and spilling sulphuric acid. Hazardous materials crews are on the scene."



This Safeware ad offers PC insurance. So if your system ever gets hit by a Tomahawk missile and then shot in the monitor by a .357 Magnum....

Multimedia That We Definitely Didn't Ask For

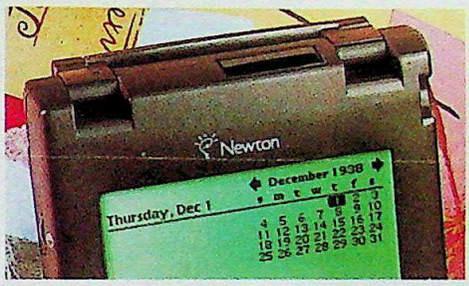
" 'What we are creating is a unique new form of content assets,' says Simon Langdon, director of business operations for Dow Jones' multimedia division. 'We now have over two years' worth of video encounters, with the Who's Who of business sitting in the can.' "—*INTER@CTIVE WEEK*



Here at ARF, low standards are the name of the game! (DTP direct catalog.)

Classified Intelligence

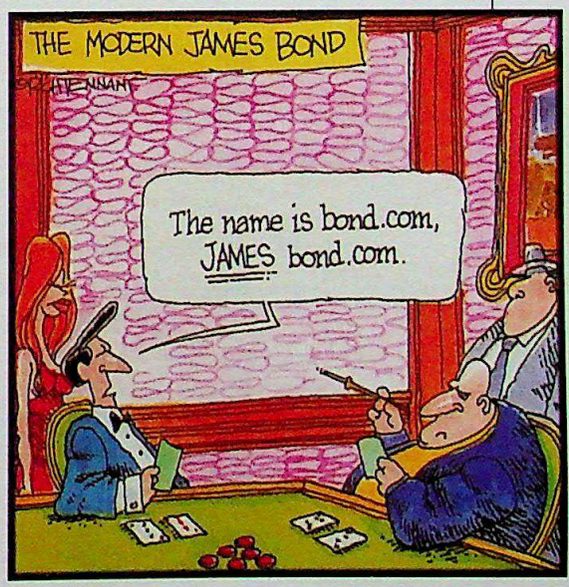
"Programmer Analyst: The successful applicant will have a computer science degree with 3–5 years experience. Proficiency with C, Unix is required. A pilot's license is also desirable."—*PEAK COMPUTING CLASSIFIEDS*



1:00 P.M. lunch with Roosevelt. 7:00 P.M. dinner with Clark Gable. (*Newton World.*)

Bill Gates for President!

And why not? As a very unofficial Web site (*http://www.gates96.org*) suggests, Bill could use his $15 billion fortune to buy 96 million votes at a cost of $156.25 per vote. Per capita, Steve Forbes paid much more.



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EDITORIAL

By Kirtimaya Varma

Constantly Connected, Remotely Related?

From the cold aloofness of Siberia to the warm promiscuity of Cyberia (telescopic word for cyber media) is a long, long way. While the former stood out as the quintessence of a well-defined cultural uniformity forcibly trying to create an egalitarian society in an unequal world, the latter is the perfect example of a confused cultural diversity spontaneously bringing about equality in an inegalitarian society. It appeals to reason that the twain shall never meet.

But like the East and the West, with due apologies to Kipling, the twain seem to be meeting, at least in the minds of many who are dreadfully watching the Net grow like nothing before it. As the world gets increasingly wired, they fear, it will become decreasingly ours, because technology will place such great powers in the hands of the state that no individual may be able to preserve his individuality



from the prying eyes of an omnipresent govern-ment. With the loss of individuality, the essence of life will be lost. A sage may find the loss of individuality a great leap forward in spiritualism. But losing the individuality to the omnipotent state is a far cry from losing it to the Omnipotent Being. While the latter is ultimate freedom, the former is ultimate slavery.

At the Fifth International Conference on Cyberspace (5Cyberconf), held recently in Madrid, many disparate voices were heard. Where does the "wired" existence leave the world we are accustomed to? There is such a massive, if not insidious, pressure to get "wired" or lose out and be left behind, that information is projected to have become the very breath of life. What is the reach of such information? The English language has a near monopoly on the Internet, and hardly 4% of Indians know English. If such is the scenario in a nation known for being English-speaking, one can well imagine the reach of the Internet in other Third World nations. I think it's an unformed syndicate of software and hardware companies, especially software companies, that are working overtime to din into public ears that information has become as important as food, air, and water.

Information, observed one delegate, is a matter of life and death for all organisms, but most of the information we are fed with nowadays does not support the complexity of experience that makes our life sustainable.... One may agree or disagree with the first part of the observation that information is a matter of life and death. I, for one, disagree. The Information Age has a tendency to depart from reality. The horde of words with the prefix *virtual,* introduced by IT—like *virtual reality, virtual space, virtual community, virtual class,* and so on—well prove this point. A vast majority of people on the earth are leading a worthwhile life without caring a hoot for the information flowing through the Net, and this will continue even in the future when the Net becomes a rage. Life and death is a natural phenomenon, not depending upon information technology for its sustainability. I feel that the delegate contradicts the first part of his statement and obliquely supports my viewpoint in the second by saying that information fed does not support the complexity of experience that makes life sustainable. A journal circulated at the conference aptly observed: "Many of us who have been living in the so-called information society for 20 years now are baffled, and feel even less cogniscent than before. This is due to progressive alteration information has undergone...We have access to more information than ever, but it is devoid of context, lacking in human quality, carrying no commitment and unable to vehicle any in return...Hence the widespread feeling that we may be increasingly networked, but are less and less related." In other words, as the world becomes smaller and smaller and becomes a global village, the distances become larger and larger. This is a very important point to be pondered over by those eminent speakers in IT who through various fora tirelessly peddle Luhan's concept of a global village made possible by IT.

An observation which appealed to me was the reminder "that the intelligence sits in front of the keyboard, and not behind the screen." One may argue that the PCs of the future may not have a keyboard, perhaps not even the screen because some researchers claim that monitors too will become obsolete. Whatever that be, the gist of the above observation is that we humans must not allow computers to become a Frankenstein monster. There is hardly any need to say that such a reminder has not come a day too soon.

We have been associating computers with superhuman powers. While the computer has acquired amazing abilities, the biggest factor which has prevented it from supplanting human beings is, to my mind, the failure of artificial intelligence to grow as a science. AI research today is more or less at the same stage as it was 40 years ago when the concept of AI was first propounded. Indeed, it has been increasingly felt that researchers are farther from their goal than they were when they first started.

Is the final goal of networking the "democratisation of media" and eventually "abolition of the media"? High-flowing these words may sound, yet they seemingly meant a lot to some of the delegates. The two expressions ring a bell in my mind. During the heydey of communism, "democratisation of the state" as capitalism gave way to communism, and eventually "withering away of the state" were famous expressions, having the semblance of inevitability. But the expressions withered away. We must pause and think whether we are over-awed with the Net.

Conferences like 5 Cyberconf, though clamoring for global attention, have not much appeal in countries like India where electricity, telephone, and network breakdown are the norm. A conference on cyber media not addressing these problems is but a limited one. □

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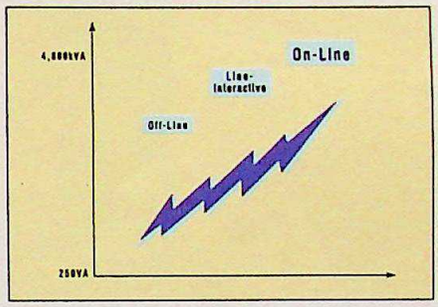
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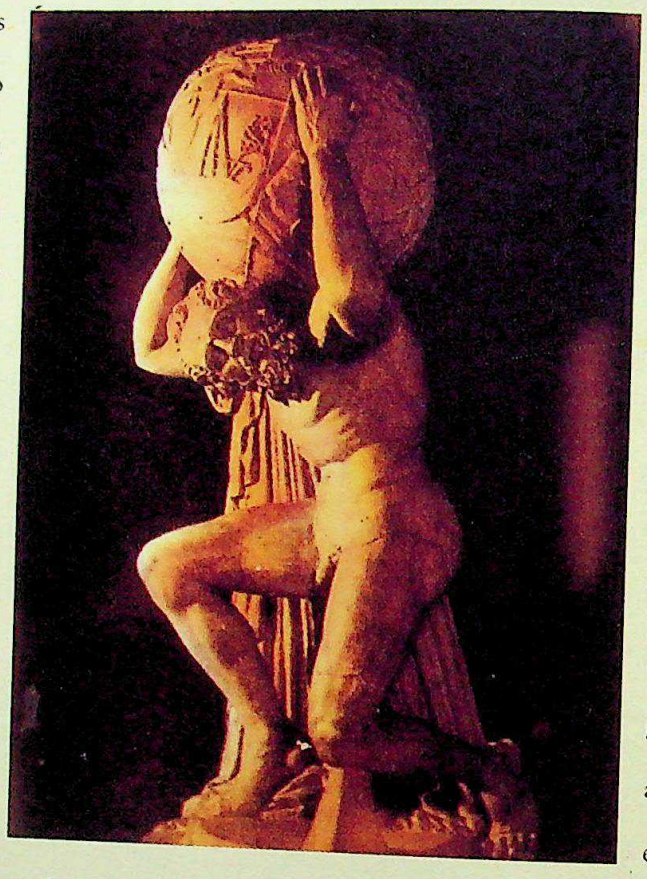
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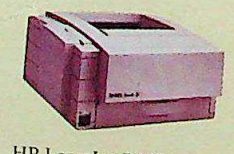
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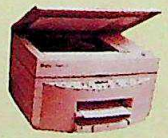
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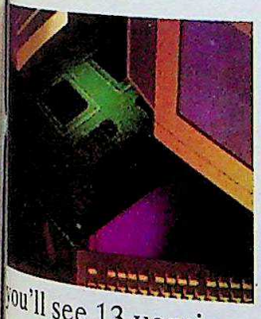
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THE PERFECT PC



By Michael J. Miller • What is a Perfect PC? At *PC Magazine,* we've maintained that no one make or model fits that description for everyone. In the pages that follow, you'll see 13 versions of an idealized Perfect PC. In case you're more into assembling a machine from the ground up, we've also included a section on the perfect components.

In our Perfect Connections section, we'll show you the best connections for office, mobile, and home use.

And later in the issue, you'll find the *PC Magazine* 150, our listing of the largest vendors in particular categories.

ILLUSTRATIONS BY VISUAL LOGIC/JACK HARRIS

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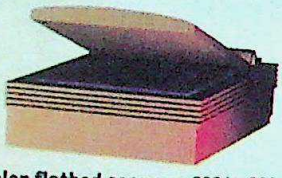
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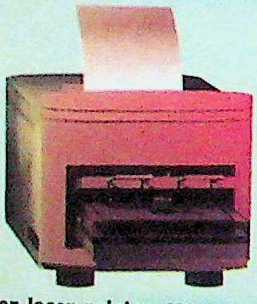
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Peripherals

If your work is graphics-intensive, add peripherals to your Dream System that will complement your work, starting with a high-resolution color flatbed scanner and a color laser printer.



Color flatbed scanner: 600 by 600 dpi optical, 1,200 by 1,200 dpi interpolated; 24-bit color minimum. Price: about $3,000.



Color laser printer: 600 dpi; 3 ppm; supports PostScript Levels 1 and 2; PCL 5; 8MB RAM minimum. Price: $5,000 and up.

Technologies to Watch

Multimedia extensions will be added to future CPUs to boost graphics and video performance. Look for Intel's P55C, AMD's K6, and Cyrix's M2.

IEEE 1394 (Firewire): This 400-Mbps serial bus will allow blazingly fast data and image transfers for high-end video and telephony equipment.



THE ULTIMATE PC

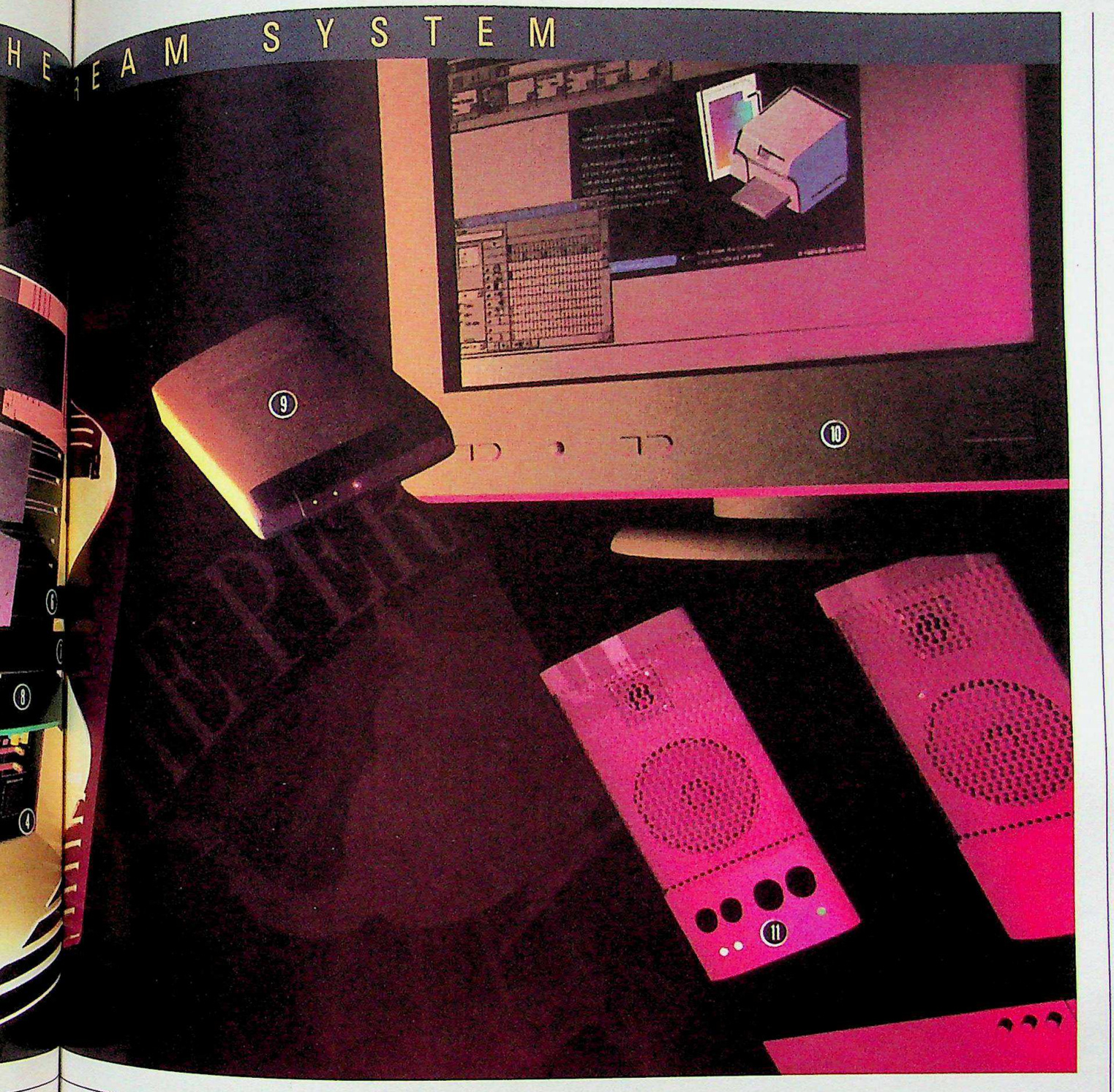
If money is no object, our Dream System is for you. With enough processing power, data storage, and memory capacity to handle today's most demanding desktop apps—whether your OS of choice is OS/2, Windows 95, or Windows NT—this system should satisfy even the most demanding power users.

Price: Pentium configuration, $7,000; Pentium Pro, $8,500.

1. **8X CD-ROM drive.** Pick a drive that uses a true 8X mechanism—not a 4X on software steroids.
2. **A DAT (4-mm) drive** to back up important files; capacity should closely track hard disk capacity.
3. **A 120MB floppy disk drive:** backward-compatible with your old 1.44MB disks.
4. **Universal Serial Bus support** to attach up to 127 devices, including keyboard and mouse.
5. **A 200-watt power supply** will ensure that you have enough power to connect more devices. Also purchase a **450-va UPS** to protect your system in the event of a power outage.
6. **A PCI graphics board with 4MB of RAM** for 1,280-by-1,024 24-bit color; VESA connector; 4MB of extra RAM (for 1,600-by-1,200 24-bit color); TV tuner or MPEG module.
7. **A 32-bit sound board** that includes wavetable and FM-synthesis support. It should also be Sound Blaster–compatible for games.

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8. **A 10/100-Mbps PCI Ethernet card** for fast connections to your LAN.

9. **An ISDN modem** for speedy external connections; all you need is an ISDN phone line.

10. **A 21-inch monitor** supporting 1,280-by-1,024 resolution at a refresh rate of 75 Hz or better. For 1,600-by-1,200 true color, you'll need at least 6MB of graphics-card memory.

11. **Speakers (20 watts per channel) with subwoofer** will provide high-quality audio.

If Your Perfect Operating System Is...

	Windows 95 or OS/2 Warp Connect	Windows NT Workstation 3.51
A	200-MHz Pentium processor	200-MHz Pentium Pro, dual-processor–upgradable
B	512K of synchronous L2 cache	256K of integrated L2 cache
C	32MB EDO or synchronous DRAM	64MB EDO or synchronous DRAM
D	4GB Fast/Wide SCSI-2 hard disk	4GB Fast/Wide SCSI-2 hard disk

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THE BASIC WORKHORSE

The configuration for an office PC can vary widely, depending on user needs. For basic word processing and e-mail functions under Windows 95 or Windows 3.x, a 133-MHz Pentium should suffice. DMI compliance is also a must for the office PC. Price: About $2,500.

1. **The desktop case** should provide plenty of expansion space for this type of PC.
2. **A quad-speed CD-ROM drive** is a bare-minimum must for any PC.
3. **A 3.5-inch floppy disk drive** is standard equipment for any PC.
4. **A 145-watt power supply** will provide plenty of juice for the office PC.
5. **A PCI graphics accelerator card** with a minimum of 2MB of RAM (1,024-by-768 true color will require 4MB of RAM).
6. **A 133-MHz Pentium CPU,** today's sweet spot for a cost-conscious PC, has enough power for basic business apps. If you need more power, P/166 is only a few hundred dollars more.
7. **256K of synchronous L2 cache** is a necessity for any PC to ensure good performance.

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The Perfect PC



8 16MB of RAM. Windows 95 won't be happy with any less, and you'll be in a better position to upgrade to Windows NT in the future.

9 A 10/100-Mbps Ethernet card. Pricing dictates that it no longer makes sense to purchase a 10-Mbps network card.

10 A 16-bit wavetable sound board that's also Sound Blaster–compatible will provide basic audio capabilities for voice-annotating documents.

11 A keyboard with wrist rest; available with either silent or "click" keys.

12 A 1.2GB Enhanced IDE hard disk will provide ample storage space for office automation tasks.

13 A 17-inch monitor for 800-by-600 or 1,024-by-768 resolution. Built-in speakers minimize clutter.

14 A personal scanner for scanning important documents or news releases.

High-End Upgrade

For serious users who need more power than the basic office PC can provide:

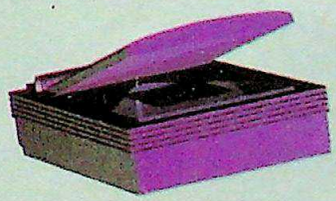
- Windows NT Workstation 3.51.
- Pentium/166 CPU.
- 32MB RAM.
- 2.5GB EIDE or larger hard disk.
- Minitower case.

Total system price: About $3,500.

Graphics Upgrade

Graphic artists require more sophisticated hardware to do their jobs. Total system price (including peripherals below): About $30,000.

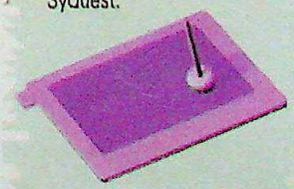
- Windows NT Workstation 3.51.
- Pentium/200 or Pentium Pro CPU.
- 64MB RAM.
- 4GB Fast/Wide SCSI-2 hard disk.
- Mini-tower case.
- 21-inch monitor; 8MB graphics-card RAM.
- Video capture board.



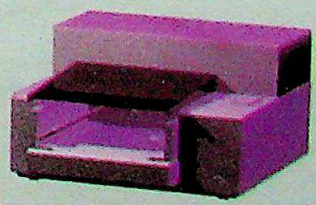
- 600-by-600 optical, color flatbed scanner.



- Removable storage system, as from SyQuest.



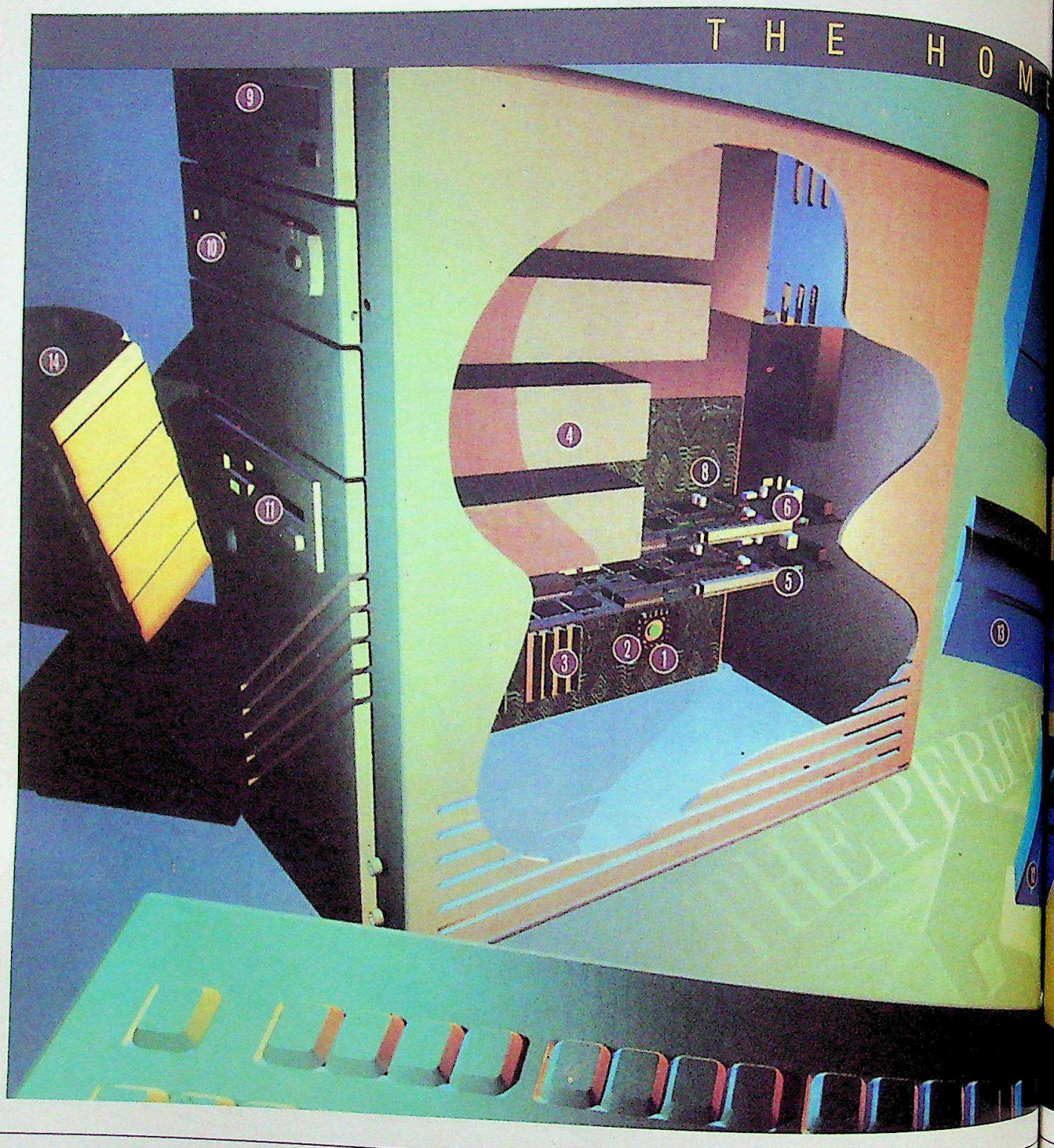
- Digitizing tablet.



- Thermal dye transfer printer, capable of Super B–size prints.

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Technologies to Watch

DVD (Digital Versatile—or Video—Disk). An emerging standard, DVD drives likely won't appear on home PCs before the end of the year.

P55C CPU with MMX. A 200-MHz Pentium with multimedia extensions should speed video performance. Target ship date: fourth quarter 1996. Cyrix and AMD should also have multimedia-enhanced CPUs in the same time frame.

"MULTIFUNCTION" DEVICE

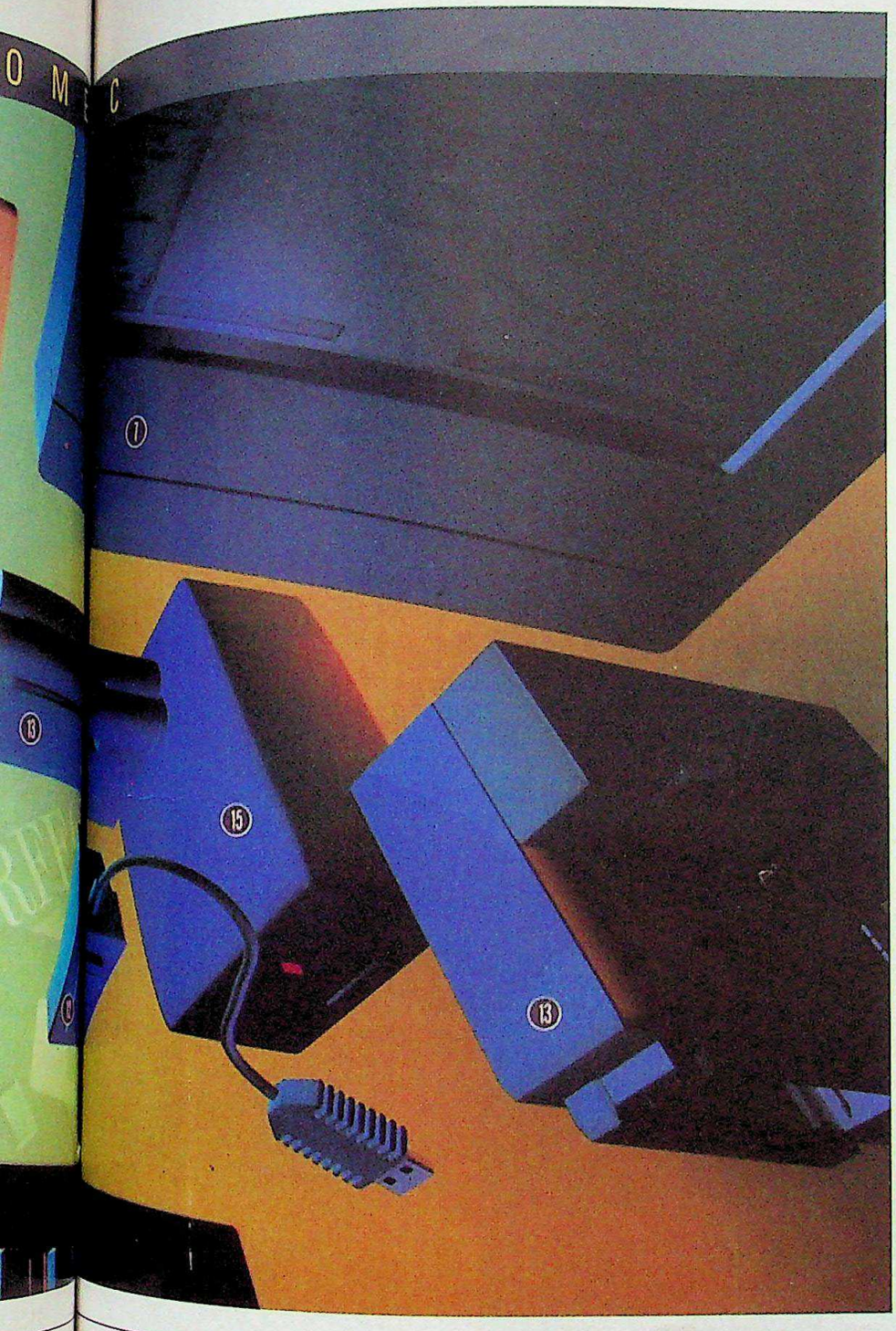
Today's home PC is no longer a single-function system: It's an edutainment machine for the kids, as well as a work-at-home PC and part-time DTP system for parents. Before buying your perfect home PC, make sure to take the needs of your entire family into consideration. Our basic machine, pictured above, should get you started.

1. **A Pentium/166 CPU** will give you the power you need; consider a Pentium/200 for about $250 more.
2. **256K synchronous L2 cache is a must for any PC** and adds only about $50 to $100 to the price. Avoid cacheless configurations—system performance will suffer.
3. **16MB EDO DRAM** is a minimum for Windows
4. **A 2GB EIDE hard disk** should ensure that won't run out of disk space in the near future
5. **32-bit wavetable sound card:** Sound
er–compatible for games.

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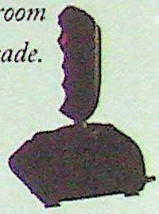
The Perfect PC



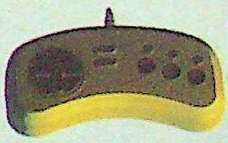
6. **28.8-Kbps modem:** Supports full-duplex speaker-phone and voice-mail functions.
7. **17-inch monitor.** For 1,024-by-768 true color, you'll need a 4MB graphics card; a 15-inch monitor requires 2MB of RAM for 800-by-600 resolution.
8. **Universal Serial Bus (USB) support** for up-coming peripherals.
9. **A 6X CD-ROM** drive is standard issue on most PCs today; 8X versions are also available.
10. **A Zip drive** provides about 100MB of data storage. Consider a Travan drive for up to 4GB of storage.
11. **3.5-inch, 1.44MB floppy disk drive;** consider an LS-120 drive for 120MB of additional storage.
12. **A large trackball** is a great pointing device that's easy for all family members to use.
13. **A four-color ink jet printer and a personal scanner** will add about $700 (total) to the cost of your new PC.
14. **Powered speakers** with subwoofer.
15. **An uninterruptible power supply** will prevent data loss in the event of a power outage.

Gamers' Peripherals

If you or your kids are gaming enthusiasts, the peripherals and components described below should bring you one step closer to turning your living room into a PC-based arcade.

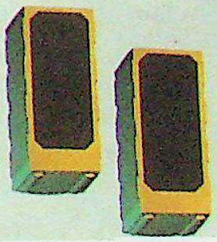


- A joystick is a must for the serious gamer.



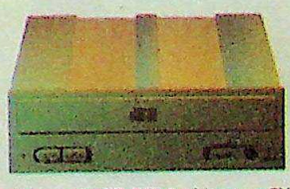
- Consider two arcade-style game pads for head-to-head competition.

- 3-D surround-sound speakers with a sub-woofer will provide realistic audio.





- A 17-inch monitor with a 4MB graphics card will support 1,024-by-768 true color.



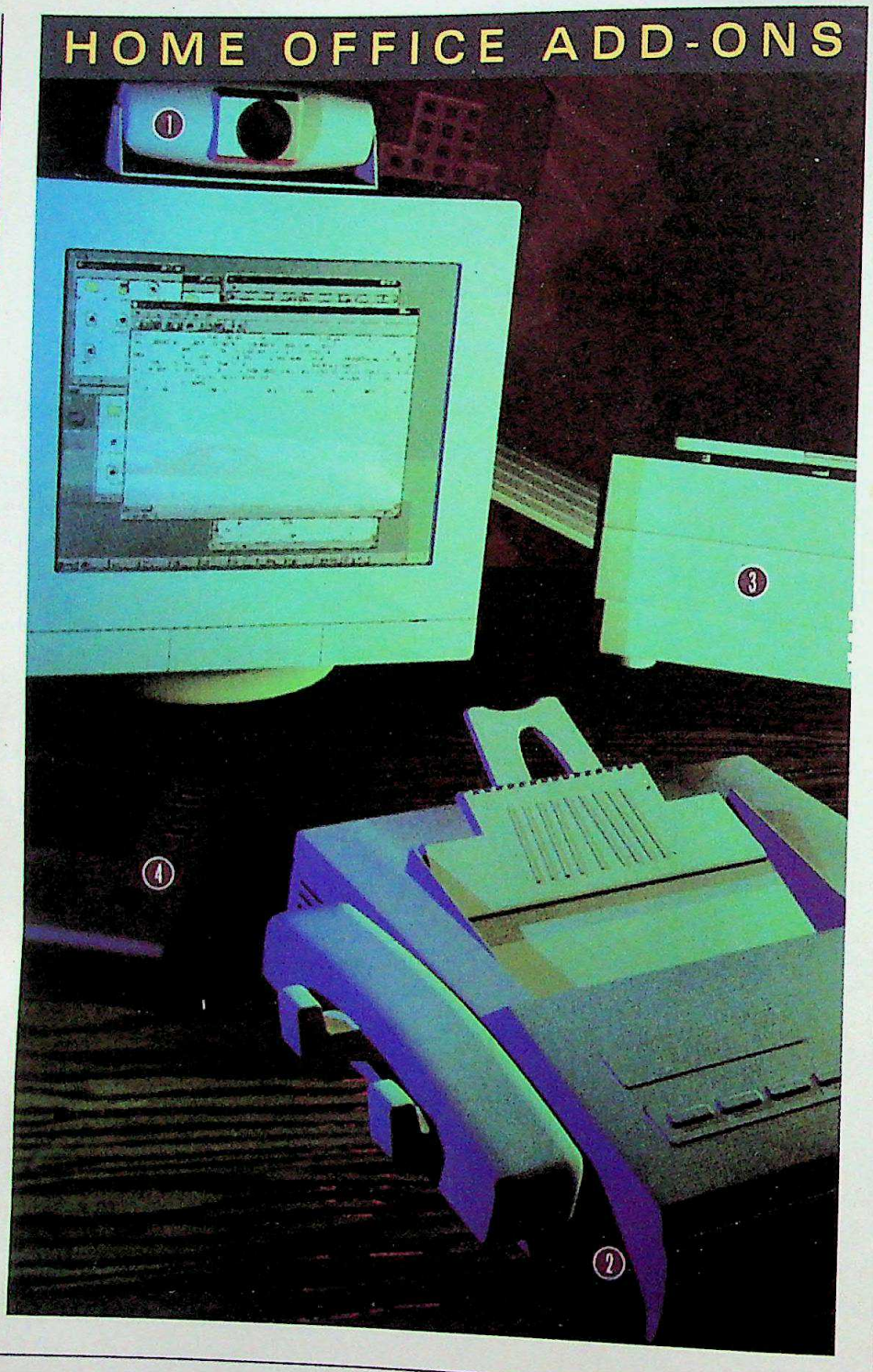
- Look for an 8X CD-ROM with a true 8X engine, not a pumped-up 4X or 6X drive.

Fast Connections

Consider an ISDN modem for fast Internet access. You'll need an ISDN phone line and service provider as well.

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OUTFITTING THE HOME OFFICE

Whether you run a business from home, work from home occasionally, or do volunteer work, you'll need to receive faxes, make photocopies, and handle phone calls. Although a PC can do all of this, standalone fax machines, copiers, and answering machines represent proven, reliable technology that anyone can use.

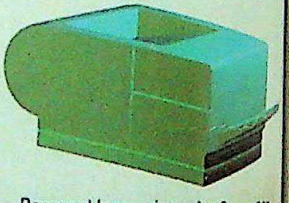
1. **Videoconferencing system** should comply with the H.320 standard for video teleconferencing.
2. **Standalone fax machine** can also double as a copier and is more reliable than a PC fax.
3. **Copier** for top-notch paper-handling flexibility and high-volume output.
4. **An answering machine** provides a vital outside link: It shouldn't be considered a cost-saving item.

For Desktop Publishing

If you need sophisticated graphics output support for producing multiple, high-quality originals or if your work demands more than the average four-color ink-jet can deliver, consider the options below.



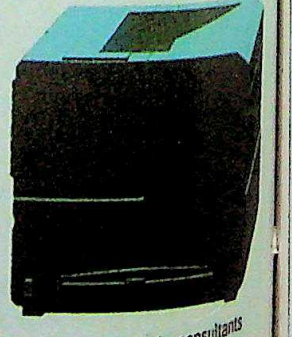
- Flatbed color scanner. Price: $500 to $1,500. For faster 32-bit performance for graphics professionals: $2,500.



- Personal laser printer, 4 to 6 ppm, 600 dpi, for proofs or camera-ready masters. Price: $400 to $500.



- Four-color ink jet printer. Price: $600 to $700. For graphics professionals, look for an ink jet that can produce tabloid-sized pages. Price: $2,000.

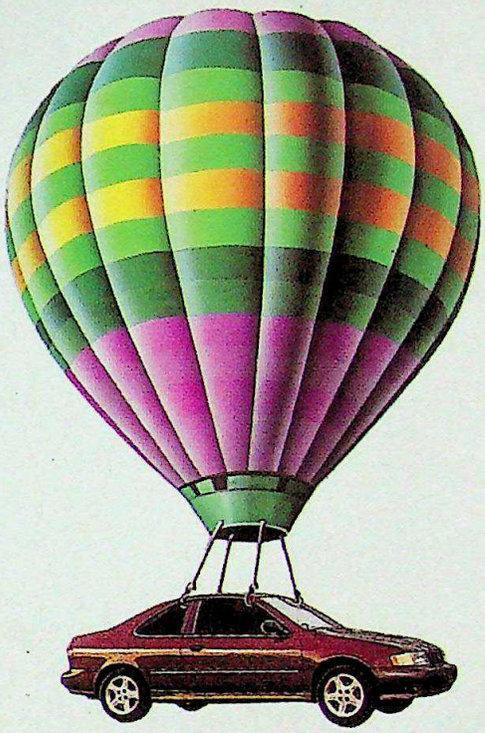


- Color laser printer, for consultants and others producing handouts or proposals. Price: $5,000+.

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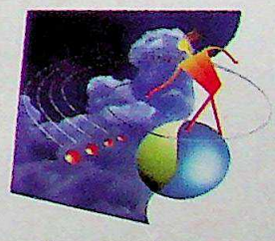
For starters, it provides you freedom from time and effort consuming CGI programming - once you couple it with the Oracle7 RDBMS. Making database integration extremely simple.

Then, Oracle WebServer also ensures the link is not broken immediately after a query is answered. This means, anyone visiting your site gets more information without having to establish links repeatedly. What makes this possible is a feature unique to Oracle WebServer - the Web Request Broker.

Besides these, Oracle WebServer is open and compliant with all Internet/Intranet standards - CGI, SSL, Java and C/C++. And is portable across all operating systems.

Now if you want to know more, contact us.

What's unfair about it?



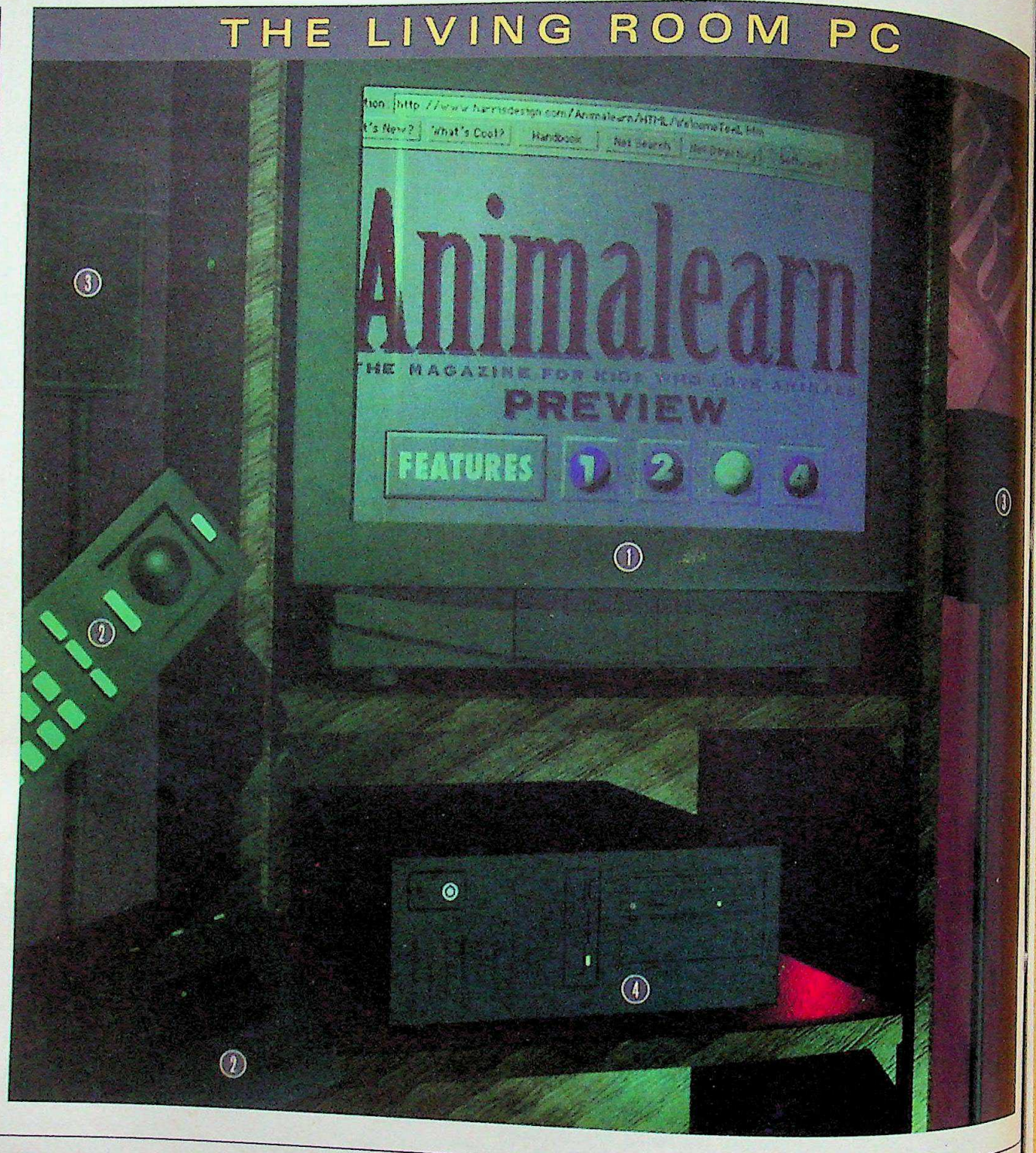
Oracle WebServer

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The Perfect PC



PC+TV *Can't decide whether to purchase a new computer or a new television set? You don't have to choose between the two anymore: As more system vendors sell Pentium PCs equipped with large monitors, fast modems, cable- and broadcast-ready TV tuners, and wireless accessories, the PC and the television are beginning to converge.* Price: $3,500 to $4,500.

System features:

1. **31-inch or larger VGA monitor.** For the time being, you'll likely have to settle for VGA-level resolution from your big-screen PC/TV.
2. **Wireless keyboard and remote** (RF or infrared), both with built-in pointing device such as touch pad or trackball.
3. **Dolby ProLogic surround-sound speaker system** (add-on cost, about $1,000, including receiver) for the true home-theater experience.

PC features:

4. **133-MHz or faster Pentium CPU.** If you plan to use your PC/TV for more computer-intensive tasks, consider a Pentium/166 CPU.

Additional PC features:

- TV tuner; receives broadcast and cable
- 28.8-Kbps DSVD modem or ISDN modem
- 1GB hard disk or better
- 16MB EDO DRAM.
- Windows 95.

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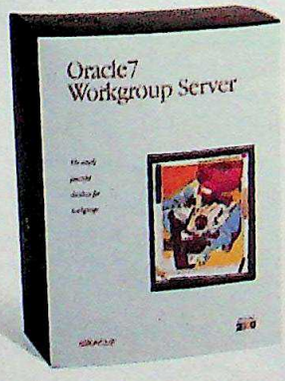
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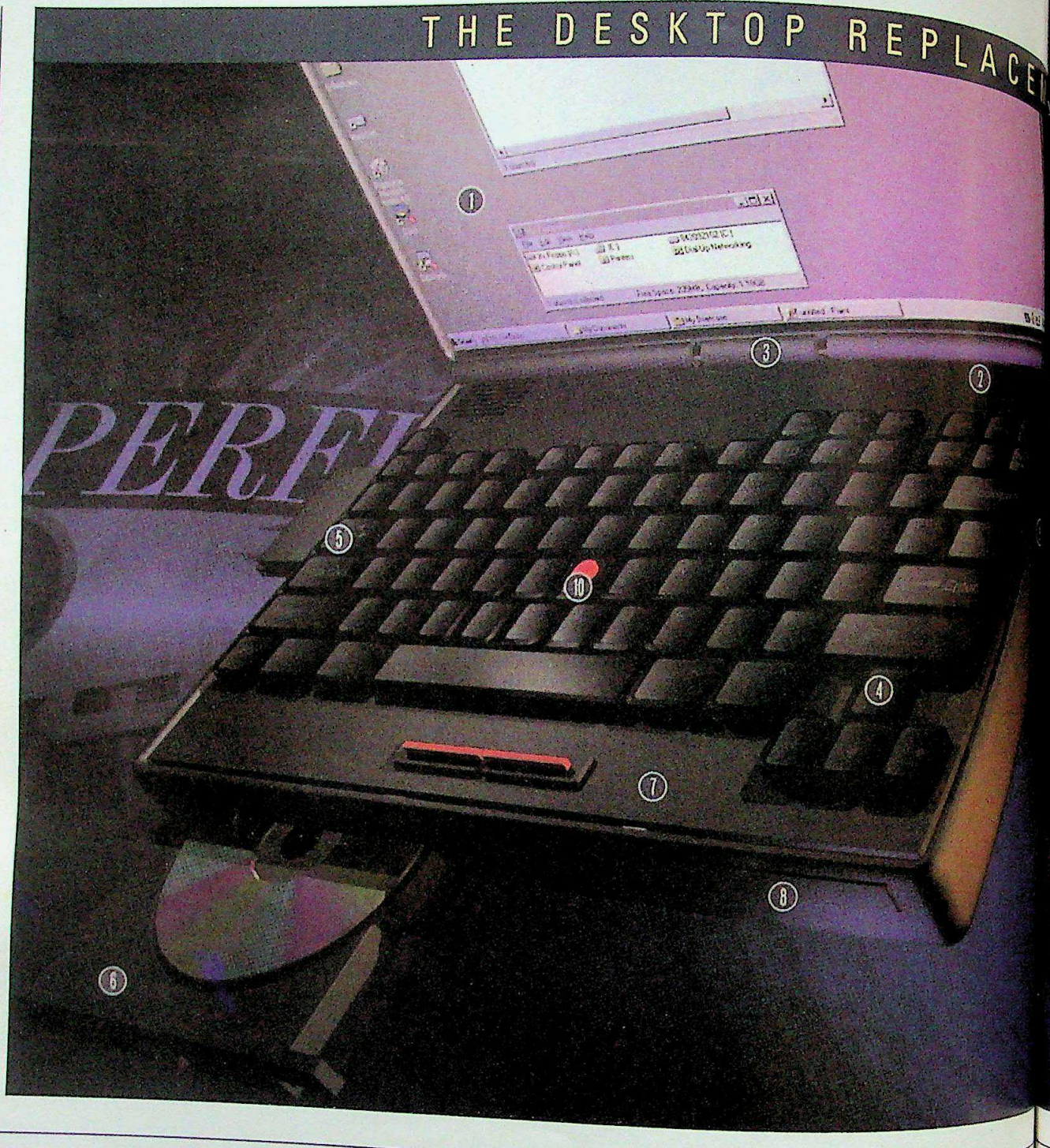
*Available on the following platforms: Microsoft Windows NT, SCO Open Server, SCO Unixware, Novell Netware, Sun Solaris x86, HP-UX HP 9000 D & E series, Digital Alpha NT, IBM AIX RS/6000 43P, E-20, F-30, E-30.

For more information contact: New Delhi Phone 6475286/87 Fax 6427653, Mumbai Phone 2832601/4151/1550 Fax 2853005, Calcutta Phone 2407450 Fax 2404114, Bangalore Phone 5593930 Fax 5593932, Madras Phone 8235271, 8235272 . Or visit us on the Web at: http://www.oracle.com/

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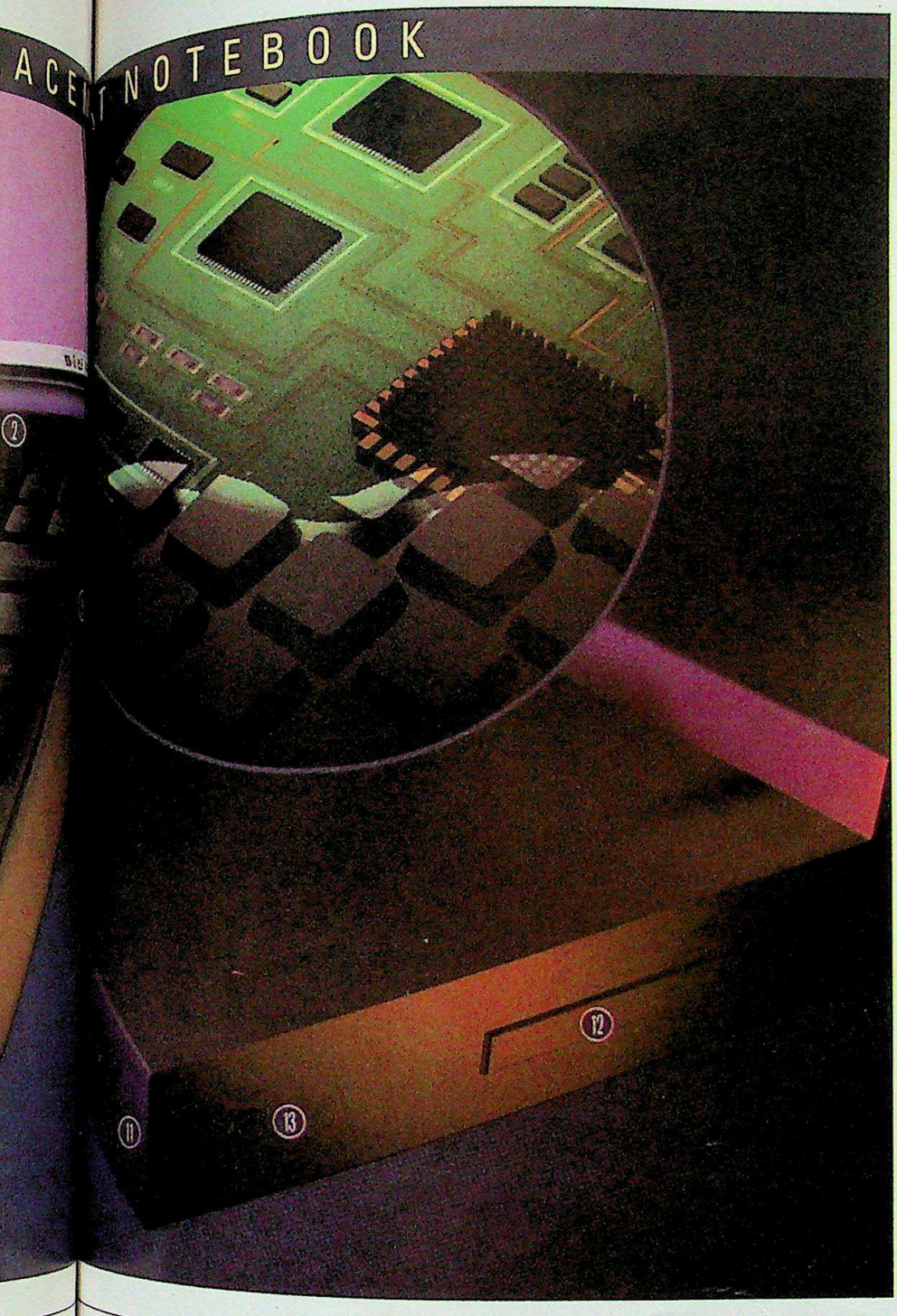
MOBILE POWERHOUSE

Our perfect desktop replacement notebook provides all the features, functionality, and flexibility that you'll need for no-compromise computing on the road, whether you're creating presentations or crunching spreadsheets. Add a docking station for full workstation support when you're in the office. Price: $6,000 to $8,000.

1. **12.1-inch SVGA active-matrix display** supports 800-by-600 resolution; notebooks that support XGA (1,024-by-768) are also available.
2. **Two integrated speakers** with audio-out for use with larger speakers. Also look for a system with a full-duplex microphone, which will allow you to use your notebook as a speakerphone.
3. **System status panel** shows battery charge level, among other system features and functions.
4. **Full-size (19-mm) keyboard** with Windows 95 hotkeys; cursor keys in inverted-T layout.
5. **Two Type II PC Card slots,** stacked one of the other, will also accept one Type III PC device. Some notebooks also support CardBus, high-end extension to the PCMCIA stand
6. **6X CD-ROM drive,** removable and swappable for a floppy disk drive, a second battery, or a ond hard disk.
7. **1.3GB or 2GB Enhanced IDE hard disk** movable and user-upgradable.
8. **Lithium-ion battery pack.** Your system should accept a second battery for maximum life.

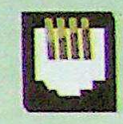
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Port Guide

The road warrior's portable powerhouse should provide the following connections, as a minimum:



• Integrated 28.8-Kbps modem: supports fax, full-duplex speakerphone, answering machine, and voice-mail.



• Fast infrared (FIR): supports infrared transfers of up to 4 Mbps.

• External VGA port.





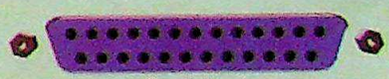
• Serial port.



• Docking station port.



• NTSC video in/out: a must for the mobile presenter to hook the notebook up to a television set using an RCA jack.



• Parallel port.



• Security slot to deter theft.

9 **Volume-control thumbwheel,** line-in/line-out jacks, speaker and microphone jacks.

10 **Integrated pointing device.** You'll find pointing sticks or touchpads on most notebooks of this class.

Docking station features:

11 **5.25-inch drive bay** for an additional device, such as a tape-backup drive.

12 **Two additional Type II PC Card slots.**

13 **Security lock** to prevent notebook theft.

Additional dock features:

- Two built-in speakers provide sound superior to notebook's integrated speakers.
- Duplicate ports.
- PCI and/or ISA expansion slots.
- SCSI-2 connector.
- 10/100-Mbps Fast Ethernet connection.

Inside the notebook:

- 133-MHz Pentium CPU with Voltage Reduction Technology.
- 256K synchronous or pipelined-burst L2 cache.
- 64-bit PCI graphics with 2MB RAM.
- 24MB EDO or synchronous DRAM.
- 16-bit wavetable sound.

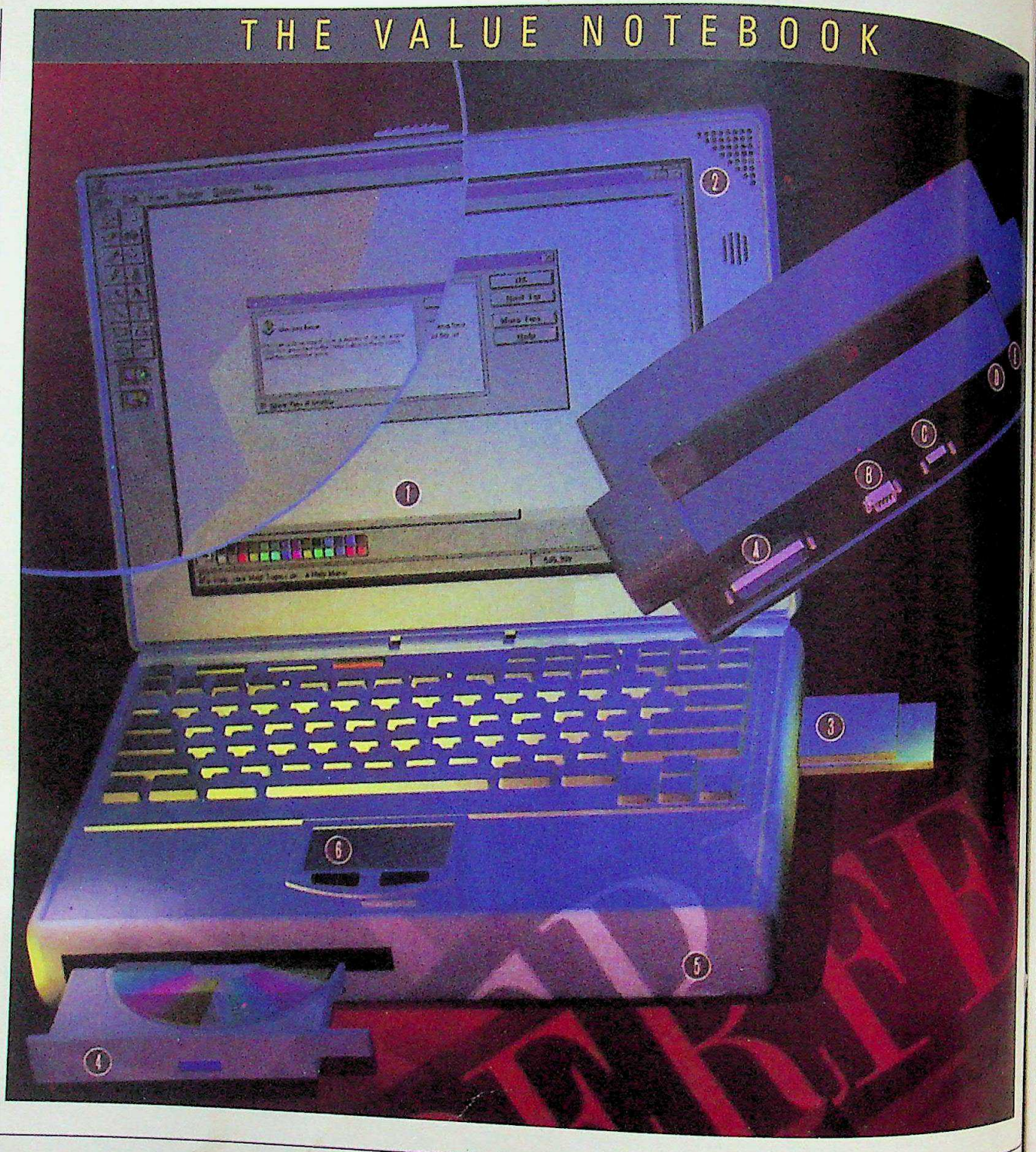
Technologies to Watch

CardBus: A high-end extension to the PCMCIA standard; provides 32-bit data path, 3.3-volt operation, synchronous operation up to 33 MHz, and "hot-insertion" capabilities.

Zoomed Video (ZV) Port. Another extension to PCMCIA standard, the ZV Port will allow video to stream directly from the PCMCIA socket adapter to the graphics controller and video frame buffer, bypassing CPU and system bus. Ideal for video capture and teleconferencing applications.

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AFFORDABLE FUNCTIONALITY

Inside the perfect value notebook, you'll find a Pentium/100 CPU, 16MB of RAM, 32-bit PCI graphics with at least 1MB of RAM, an 800MB or larger hard disk, 16-bit sound, and an integrated 28.8-Kbps modem. Price: About $2,500.

1. **10.4-inch active-matrix or 11.3-inch dual-scan display,** if you need a larger screen.
2. **Two speakers and microphone.**
3. **Two stacked Type II PC Card slots:** Will accept a single Type III device.
4. **Removable 4X CD-ROM drive,** replaceable with 3.5-inch floppy disk drive.
5. **Nickel-hydride or lithium-ion battery.**
6. **Integrated pointing device:** Touchpad or pointing stick.

Port Replicator *This device duplicates all ports for use with external monitor and other devices when you're stationary. Price: About $99; with integrated 10-Mbps Ethernet, $199.*

A. Parallel port C. VGA port E. Mouse port
B. Serial port D. Keyboard port

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PC MAGAZINE'S 1996 COMPUTER BUYERS' GUIDE

How to Buy the Perfect PC

Buying a new PC for your home or office can be confusing. Today's PC market is vast, offering a system for virtually everyone, regardless of computing needs or budget. The section below will help get you started; before you begin shopping fill out the Buyers' Worksheet that follows. If you're considering upgrading your old PC, or can't decide where to spend those extra few dollars on a new PC.

Before you begin your PC buying expedition, ask yourself three questions: What do I want to do with my new PC? How much money do I want to spend? And how comfortable am I tinkering with computers? The answers will narrow your choice of where to buy your PC. Different purchase channels specialize in different types of PCs and present a wide range of prices and services. Having an idea of the minimum levels of service and support you need from a vendor and what level of power you require should further narrow the field.

WHERE TO SHOP There are many different outlets where you can buy your PC, each specializing in different types of systems. If you're fairly well versed in computerese and know what you want, consider purchasing from a *direct vendor* (mail-order). Most mail-order vendors offer a wide range of hardware and software, and they'll usually custom-configure the PC to your specifications. Many direct vendors also have great deals on software, offering add-on bundles and multimedia upgrades, as well as printers.

You may choose to purchase your PC through a *computer retailer,* such as a computer superstore, electronics store, or office-supply outlet; they also offer large selections of hardware, software and peripherals. Be aware that their salespeople may not be well educated about the features of the computer products, so you should have a good idea of what you want before going. Many of these stores, however, have a separate section for volume or corporate accounts, where more help will be provided. Also keep in mind that although retailers' prices should be competitive, they may be higher than mail-order prices.

A *value-added reseller* (VAR) or a computer consultant can also supply a PC. If you're looking for a complete, turnkey solution, a VAR is an excellent choice. In addition to configuring systems to your specifications, many VARs will also provide installation and long-term maintenance services (for a fee, of course). Many can also provide integrated, networked solutions customized to fit your business's needs.

You may choose to purchase your PC through a computer retailer, such as a computer superstore, electronics store, or office-supply outlet; they also offer large selections of hardware, software and peripherals. Be aware that their salespeople may not be well educated about the features of the computer products, so you should have a good idea of what you want before going.

WHAT TO BUY Today's PC market is all Pentium-class and Pentium Pro. The sweet spot on the Intel processor scale today—if cost is a major consideration—is the 133-MHz Pentium. Not only does this CPU have the power to handle most of today's mainstream business applications, it can grow with you. If you're not so constrained by cost, consider a Pentium/166 or the newly released Pentium/200. But be aware that the latter has just come out of the gate, and the prices, though competitive, are still high. Keep in mind that you get better performance from a CPU that runs on a 66-MHz system bus (Pentium/100, 133, 166, or 200), than you do from a processor coupled to a 60-MHz bus (Pentium/120 or 150).

SERVICE, SUPPORT, AND WARRANTIES The service and support that a vendor offers are every bit as important as the hardware it sells, especially if you're not prepared to fix your PC yourself. Many vendors offer three-year warranties—a definite plus. Many also offer on-site service free for one year and additional years of service for a nominal fee.

Most PC vendors offer toll-free telephone technical support. Their hours vary widely, however, from 24 hours, 7 days a week to weekday business hours only. If you're buying a home PC and will be using it at night, a vendor with technical support only during business hours might not make sense. Corporate and volume customers should look for vendors offering a special support number, which will ensure a speedier response.

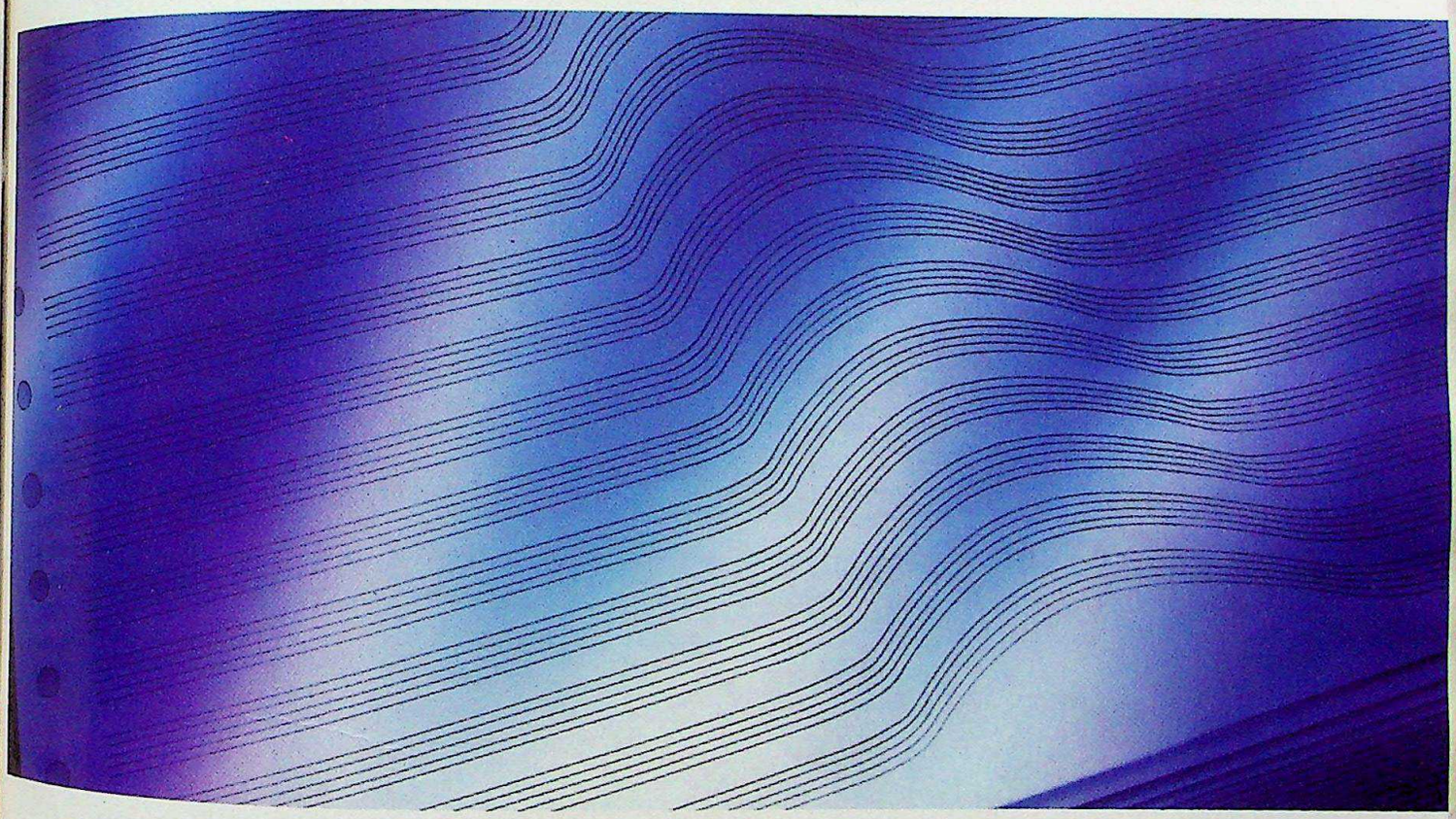
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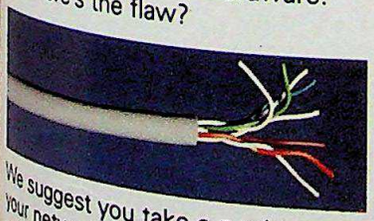
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SIEMENS

Transmitting data *(bump!)* can seem like *(bump!)* hurtling down a grand prix track with *(screech!)* speed breakers... *whew!*



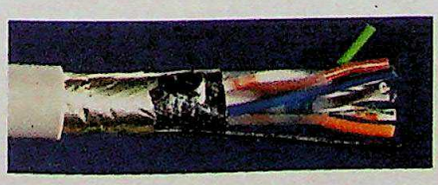
Hair-raising? Puzzling too. Because you have the latest software and the best hardware. So where's the flaw?



We suggest you take a peek at your networking cables. The cables you use, in all probability are the **unshielded twisted pair (UTP)** variety. They love to work at an agonising 'slow-motion' pace. Because they don't have a protective shield. Now what?

No, no, please don't fret. There is a way out of this. **Presenting ICCS Data5 Networking Cables, from Siemens. Fully shielded twisted pair cables now available in India.** They ensure that your data can be transferred:

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The Perfect PC

1996 Buyers' Worksheet

Before you begin shopping for your perfect PC, take a few minutes to fill out this worksheet, so you'll know exactly what you want. Consult our recommendations below for a dream system, office PC, and home PC to help you decide.

PERFECT PCs: PC MAGAZINE'S RECOMMENDATIONS

FEATURE	THE DREAM SYSTEM	THE OFFICE PC	THE HOME PC
Processor	Pentium/200 or Pentium Pro/200	Pentium/133 or Pentium/166	Pentium/166 or Pentium/200
L2 cache	512K synchronous*, 256K integrated**	256K synchronous	256K synchronous
System memory	32MB–64MB EDO or SDRAM	16MB EDO	16MB EDO
Expansion bus	PCI/ISA with USB	PCI/ISA (USB optional)	PCI/ISA with USB
Hard disk	4GB Fast/Wide SCSI-2	1.2GB EIDE (minimum)	2GB EIDE (minimum)
CD-ROM drive	8X	4X (minimum)	6X
Sound card	32-bit with wavetable synthesis	16-bit	32-bit with wavetable synthesis
Speakers	Self-powered with subwoofer	2-piece or integrated on monitor	Self-powered with subwoofer
Graphics card memory	4MB–8MB	2MB	2MB
Monitor size	21-inch	17-inch	15-inch (minimum)
Modem	ISDN	28.8/14.4-Kbps	28.8/14.4-Kbps
Network interface card	10/100-Mbps PCI Ethernet	10/100-Mbps PCI Ethernet	Optional
Floppy disk drive	3.5-inch, 1.44MB	3.5-inch, 1.44MB	3.5-inch, 1.44MB or LS-120
Tape backup	DAT	Optional	ZIP or DAT
Uninterruptible power supply	Standard	Optional	Recommended
High-speed serial and parallel ports	Standard	Recommended	Recommended
Infrared port	Standard	Optional	Optional
Keyboard and mouse	Standard	Standard	Standard (USB recommended)
Operating system	Windows 95*, Windows NT**, or OS/2*	Windows 95*, Windows NT**, or OS/2*	Windows 95
Software bundle	Standard	Optional	Standard
Warranty	3 years	3 years	1 year (minimum)
On-site service	3 years	1 year (minimum)	1 year (minimum)
24-hour, 7-day support	Standard	Standard	Recommended
Total price	$7,000–$8,500	$2,500	$3,500

*Pentium. **Pentium Pro.

PERFECT PCs: YOUR THREE CANDIDATES

FEATURE	MODEL:	MODEL:	MODEL:
Processor			
L2 cache			
System memory			
Expansion bus			
Hard disk			
CD-ROM drive			
Sound card			
Speakers			
Graphics card memory			
Monitor size			
Modem			
Network interface card			
Floppy disk drive			
Tape backup			
Uninterruptible power supply			
High-speed serial and parallel ports			
Infrared port			
Keyboard and mouse			
Operating system			
Software bundle			
Warranty			
On-site service			
24-hour, 7-day support			
Total price (including tax and shipping)			

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Brought to you by **Modular**, each product is a result of painstaking research and years of experience. The ultimate range in multilingual solutions is available in over **80 cities** and has an installed base of over **12,000 users**.



Shree-Lipi : Shree-Lipi is an Indian Language script processor under MS Windows, with a collection of fonts and utilities compatible with both **IBM PC and Macintosh**. The ultimate in desktop publishing, it supports the largest collection of Indian typefaces in all Indian scripts and has a variety of keyboard layouts.

Avishkar : Avishkar is a **font styler** that can be used with Shri-Lipi to get virtually infinite font styles with condensation, expansion, outlining, about 180 serifs, envelope transformations etc. Currently Avishkar is available for Devnagri and Gujarati with 20 bonus fonts.

ShabdaSagar : ShabdaSagar is a DOS based **multilingual word processor** with commands that are similar to Word Star. User friendly to the core, it supports a majority of printers in use. Another attractive option is the availability of a variety of keyboard layouts.

Shree-Lekha : Shree-Lekha is a DOS based Indian language script processor available with **fonts for multimedia** video graphics. Its diverse features support various applications including Autodesk Animator & 3D Studio etc.

Prateek-Pro : A software package for preparing General Purpose Identity cards in Indian Languages, its applications can include Labels, Tags etc also. The package includes a simple data base editor, along with an image grabbing module, flexible layout designing & printing module for use in both B/W & colour photographs as well as text.

Multikeys : Multikeys is a DOS based keyboard layout handler for Indian Languages to be used with GIST cards. It allows the use of popular keyboard layouts like Modular, Godrej, Ramington etc. Also available is a program for generating user defined layouts.

For more details contact :

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PC MAGAZINE

The Ultimate Upgrade

You've invested money and time into your PC. You thought it would last forever, but technological advances are shrinking your system's lifespan. Can you buy time with a replacement part, or should you get a new PC? We've compiled the following upgrade list to help make that choice. On the opposite page, we give advice on where to spend an extra $300 on a new PC, as well as tips on how to optimize your old PC's performance.

WHEN TO UPGRADE

Each component below is listed at its lowest acceptable level for a Microsoft Windows 95–equipped computer today (for example, a 486DX2/66 is the slowest processor that you should be using). If you find that your machine is behind this technological curve, you should consider investing in a new system.

PROCESSOR: 486DX2/66 A 66-MHz 486-class CPU—still very much in use in office PCs today—has just enough processing power to keep most Windows 95 applications going. Its days are numbered, however, so start planning for at least a Pentium/133-based PC. You can upgrade the processor in many systems, but remember that CPU upgrades don't address other possible system shortcomings, such as a slow graphics card or a slow hard disk.

MONITOR: 14-INCH, 0.31 DOT PITCH The graphical nature of Windows 95 makes a monitor of at least 14 inches (measured diagonally) mandatory. A smaller screen or a dot pitch of more than 0.31 mm guarantees eye strain. A 15- or 17-inch monitor with a dot pitch of 0.28 mm or less is truly what you need for Windows 95. Look for monitors which support the DDC1 or DDC2 standard, as these offer Plug and Play compatibility with Windows 95.

LOCAL-BUS SUPPORT: MANDATORY If your PC has nothing but ISA expansion slots in it, you're in luck: You now own an antique. Realistically, your PC must have some form of local-bus support—be it VL-Bus, PCI, or a proprietary design—to support Windows 95's graphics, deliver data at an acceptable rate, and handle full-motion video clips. As long as you can find local-bus graphics boards and disk controllers to work with your PC's local-bus design, you're okay for the time being. Your next PC must have PCI support to be viable for the future.

MEMORY: 16MB OF RAM 16MB is the minimum amount of memory you should have. Even Microsoft has stopped claiming that Windows 95 PCs run with 4MB. Performance improves as you add more RAM, and memory prices have come down significantly since the beginning of the year.

HARD DISK: 540MB Windows 95 applications are big. Don't expect even a 340MB hard disk to support as you upgrade your operating system and applications from Windows 3.*x* to Windows 95. A 540MB hard disk is still limiting, but a disk compression utility (such as one built into Windows 95) can buy you some time. Your next hard disk should be 1.2GB or larger.

VIDEO: 1MB DRAM A graphics subsystem based on a VL-Bus, PCI, or proprietary local bus is a must for Windows 95. If your PC lacks local-bus support, see the next item below.

CD-ROM DRIVE: DOUBLE-SPEED Single-speed CD-ROM drives are clearly obsolete, but you can still get away with using a double-speed unit. Since 6X drives are only marginally more expensive than 4X drives, a 6X drive is what you should aim for in your next PC.

MODEM: 9,600-BPS FAX AND DATA While 28.8-Kbps fax modems are the standard today, a 9,600-bps fax modem will still allow you to access most online services effectively. But 9,600 bps is a bit slow for any real surfing on the World Wide Web, unless you're willing to turn off the graphics support on your Web browser.

SOUND CARD: 8-BIT If all you need is audio, an 8-bit sound card will give it to you, albeit with all the fidelity of AM radio. If you want the demons in your computer games to sound more menacing than mice with laryngitis, an upgrade to a 16-bit audio board will get you better sound. Wavetable-synthesis support is your next step if you want truer sound from your 16-bit card.

PRINTER: INK JET With ink jet printers starting at less than $300, there's no reason to use a dot matrix or daisy wheel printer today. A three-color ink jet printer with an option for switching to black-ink–only printing is as low as you should go when you shop for a new printer. For only about $100 more, you can purchase a four-color ink jet for true blacks, instead of greenish process black.

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Upgrade Guide

THE $300 QUESTION

Picture this: You're in a computer store and you've just paid for your new PC. There's great news: The total is $300 less than what you budgeted. After giving yourself a well-deserved pat on the back, you put the PC aside, stride back into the store, and start shopping anew. What can you do to improve your PC for $300 or less? Here are a few suggestions.

UPGRADE THE SOFTWARE Many PC vendors offer deeply discounted prices on extra or upgraded software packages if purchased at the same time as a PC.

BUY A LARGER MONITOR For $300 or less, you can easily upgrade from a 14- or 15-inch monitor to a 17-inch model. Just make sure the monitor's dot pitch is 0.28 mm or less.

LONGER WARRANTY If you don't know your way around the inside of a PC, extending your system's service or on-site warranty for an extra year or two might not be a bad idea.

MORE RAM 16MB is the bare minimum for comfortable operation under Windows 95. Remember also that memory upgrades are usually cheaper when done at the same time as a system purchase.

EXTRA VIDEO MEMORY Here again, while 2MB of video DRAM, VRAM, or other flavor of video memory is fine, upgrading to 4MB will greatly accelerate performance when dealing with full-motion video or high-resolution graphics. It will also allow you to have greater color depth.

BETTER AUDIO You can upgrade to a sound card that supports wavetable audio (or purchase a daughtercard to add wavetable capabilities to your sound board) and trade up to a three-piece speaker system with a subwoofer.

ERGONOMIC CHAIR You'll probably spend a good deal of your time by your computer; investing in a chair with proper support can save you pains in the future.

INK JET PRINTER A serviceable three- or four-color ink jet printer can be bought for $300 or less.

TAPE BACKUP SYSTEM OR ZIP DRIVE Both can safeguard your data, although a tape backup system may be slow. ZIP drives are also removable, an added convenience.

UNINTERRUPTIBLE POWER SUPPLY A UPS will protect your data in the event of a power failure. It may seem like overkill, but for any PC today—especially if you run your business on it—it's an indispensable peripheral.

PERSONAL SCANNER For less than $300, you can purchase a small monochrome scanner that takes up no more table space than a box of aluminum foil.

OPTIMIZING YOUR PC

Does that hourglass icon seem like a permanent fixture on your Windows 95 desktop? If so, chances are good that there's a setting or feature that you've neglected to enable, disable, or install on your PC. On the everlasting quest for that last ounce of performance, remember to do the following.

UPDATE YOUR DRIVERS Even new PCs may come with old 16-bit hardware drivers instead of more robust 32-bit versions. Check with manufacturers for the latest drivers.

DEFRAGMENT YOUR HARD DISK When DOS or Windows saves a file, it doesn't necessarily save it in one piece. A disk defragmenter will enhance disk performance and improve your chances of recovering deleted files.

USE THE PRIMARY IDE CHANNEL Make certain that your IDE hard disk is connected to the primary IDE channel of your hard disk controller or motherboard and not to the slower secondary channel. Also check your unit's BIOS setup screen (and your hard disk manual) to see if the primary IDE channel is set for the fastest data-transfer mode your hard disk can handle.

TURN OFF THE VIRTUAL DESKTOP Some graphics drivers allow you to use a higher resolution than your screen can handle by creating a virtual desktop—which takes up more graphics memory. In this mode, you can't view entire images at once, but you can easily move to all areas.

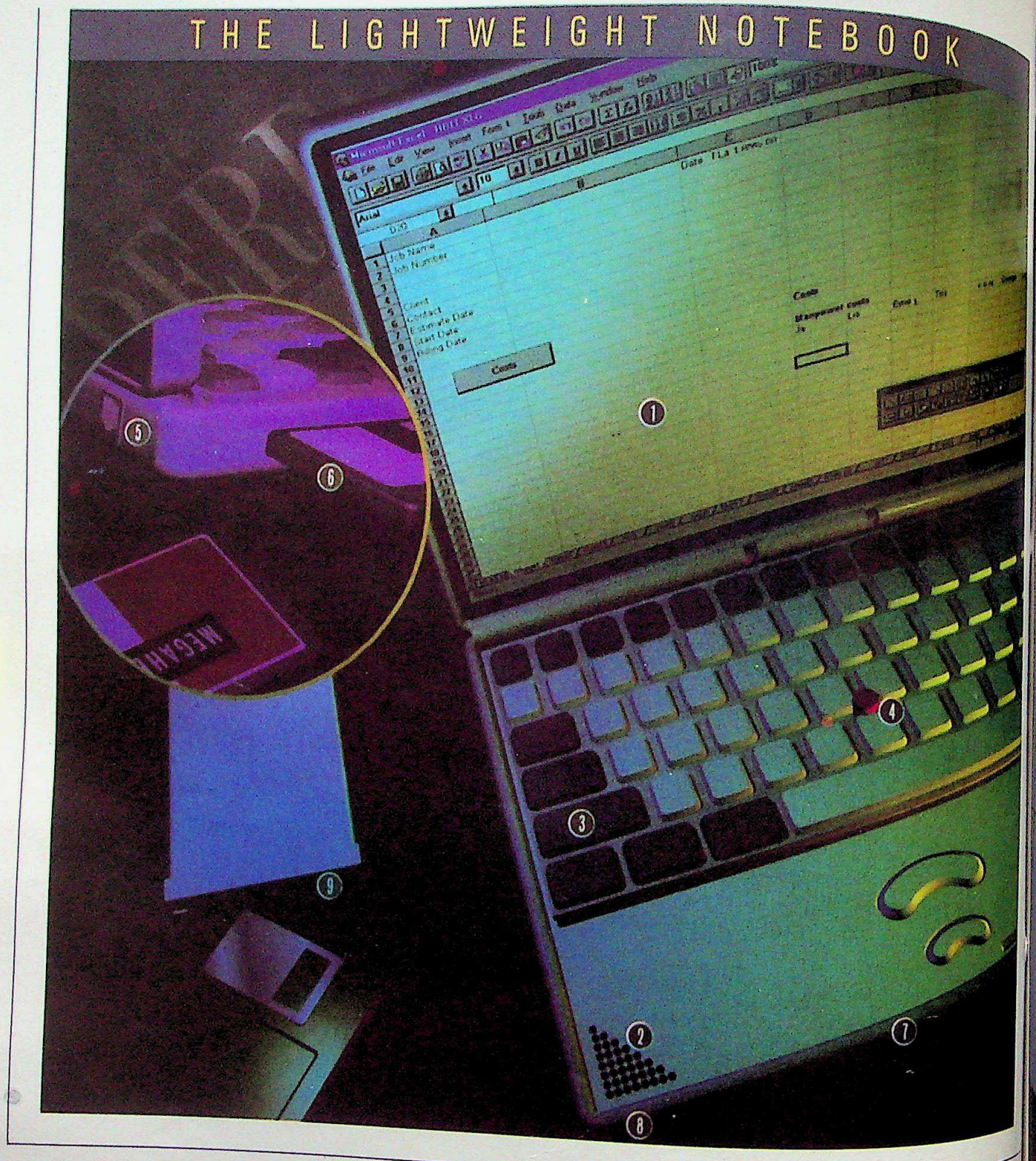
DECREASE COLOR DEPTH, SCREEN RESOLUTION, OR BOTH High screen resolutions and especially high color depths can slow graphics performance.

EXAMINE HARD DISK SETTINGS While the 32-bit disk access available in Windows 3.*x* offers minor performance benefits, Windows for Workgroups 3.11 and Windows NT offer 32-bit-file access, which truly enhances disk performance. Check the Control Panel to see if these features are enabled. (Some software utilities conflict with 32-bit disk access, so check first.) Windows 95 uses 32-bit disk drivers by default.

OPTIMIZE VIRTUAL MEMORY Let Windows 95 manage virtual memory for the best performance. Use the maximum suggested settings in Windows 3.*x* where possible.

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THE ROAD WARRIOR

Today's subnotebooks (some are championing "ultra-portable" instead) aren't "sub" anything. Look for a machine with a Pentium/100 or faster CPU, a 1GB or larger hard disk, 16MB of RAM, and 256K of L2 cache—in a less-than-5-pound package.

Price: $2,500 to $3,500

1. **10.4-inch** or larger active-matrix SVGA display.
2. **Integrated speakers and microphone.** 16-bit wavetable audio support is a plus.
3. **Full-size** or slightly shrunken (18-mm) keyboard.
4. **Integrated pointing device.** Pointing sticks and trackballs are popular in this class.
5. **A built-in 28.8-Kbps fax modem** will save you the hassles associated with PC Card modems.
6. **Two stacked Type II PC Card slots,** which will accept a single Type III device.
7. **A lithium-ion battery pack** is an absolute must for maximum battery life.
8. **Infrared transceiver,** 115-Kbps IRDA-compliant or 4-Mbps Fast-IR.
9. **External 3.5-inch floppy disk drive:** The perfect component to leave at home to shave that other pound off the total travel weight.

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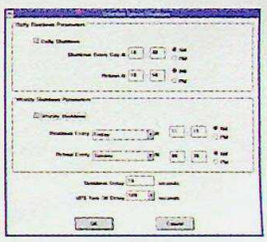
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Power problems are the single largest cause of network data loss. Which is why high-performance computers like Compaq's ProLiant server rely on APC. In fact, APC UPSs protect more networks worldwide than any other brand.

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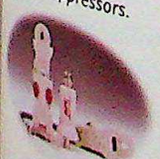
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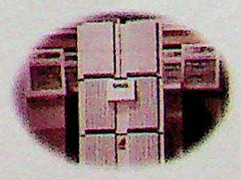
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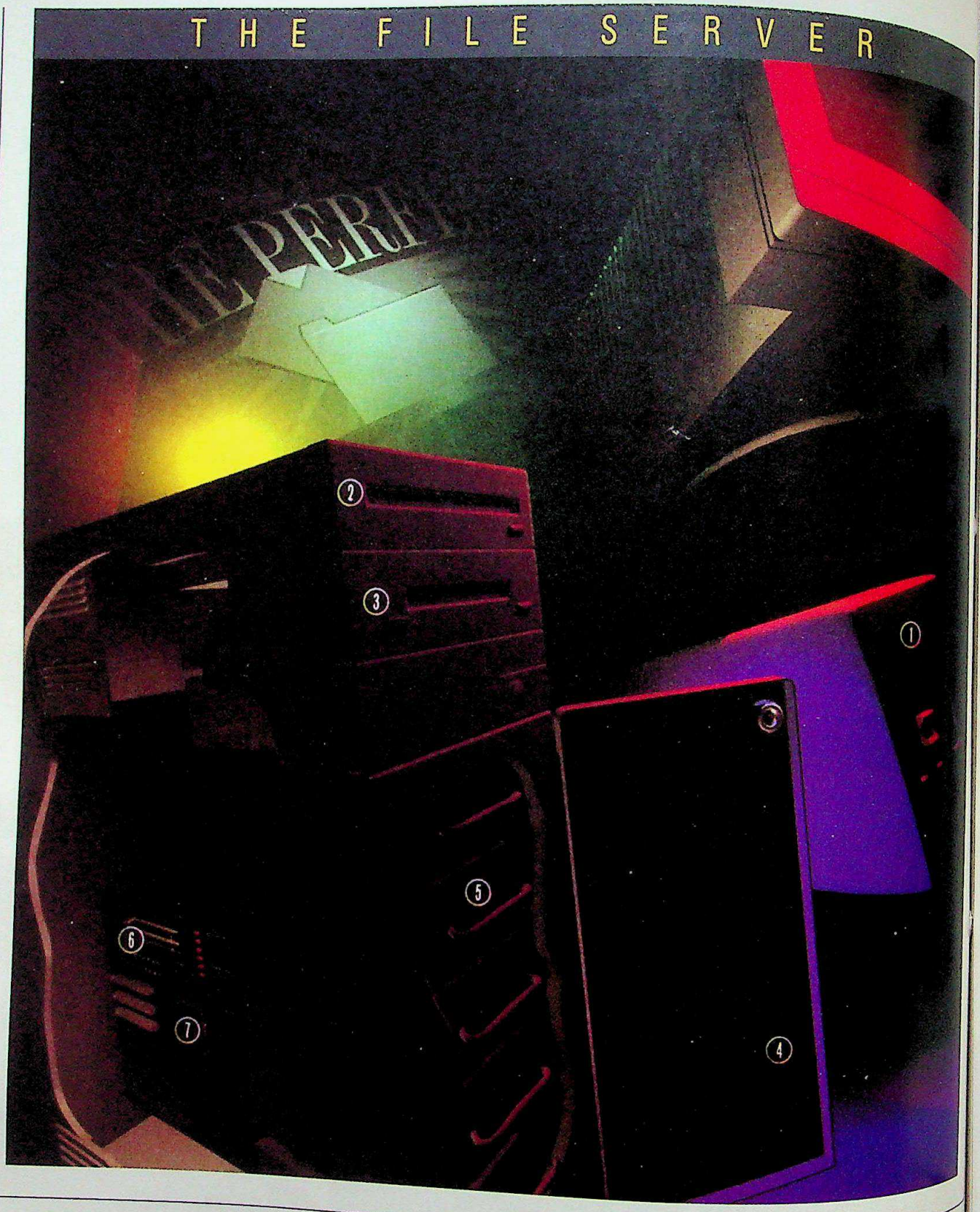


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The configuration illustrated here will support a department of 60 or more clients. A comprehensive server-management solution is also highly recommended. Price: $15,000 to $20,000.

1. **UPS:** Should support the server's power consumption for at least 20 minutes.
2. **DAT (4-mm) drive.** Capacity meets disk subsystem capacity.
3. **Quad-speed CD-ROM drive.**
4. **Lockable front panel.**
5. **Hot-swappable hard disks** to support co... al RAID array. 8GB of storage recommend...
6. **128MB error correction code (ECC) RA...**
7. **Minimum 133-MHz Pentium,** upgradable... dual-processor configuration. The CPU sho... support a 66-MHz system bus.

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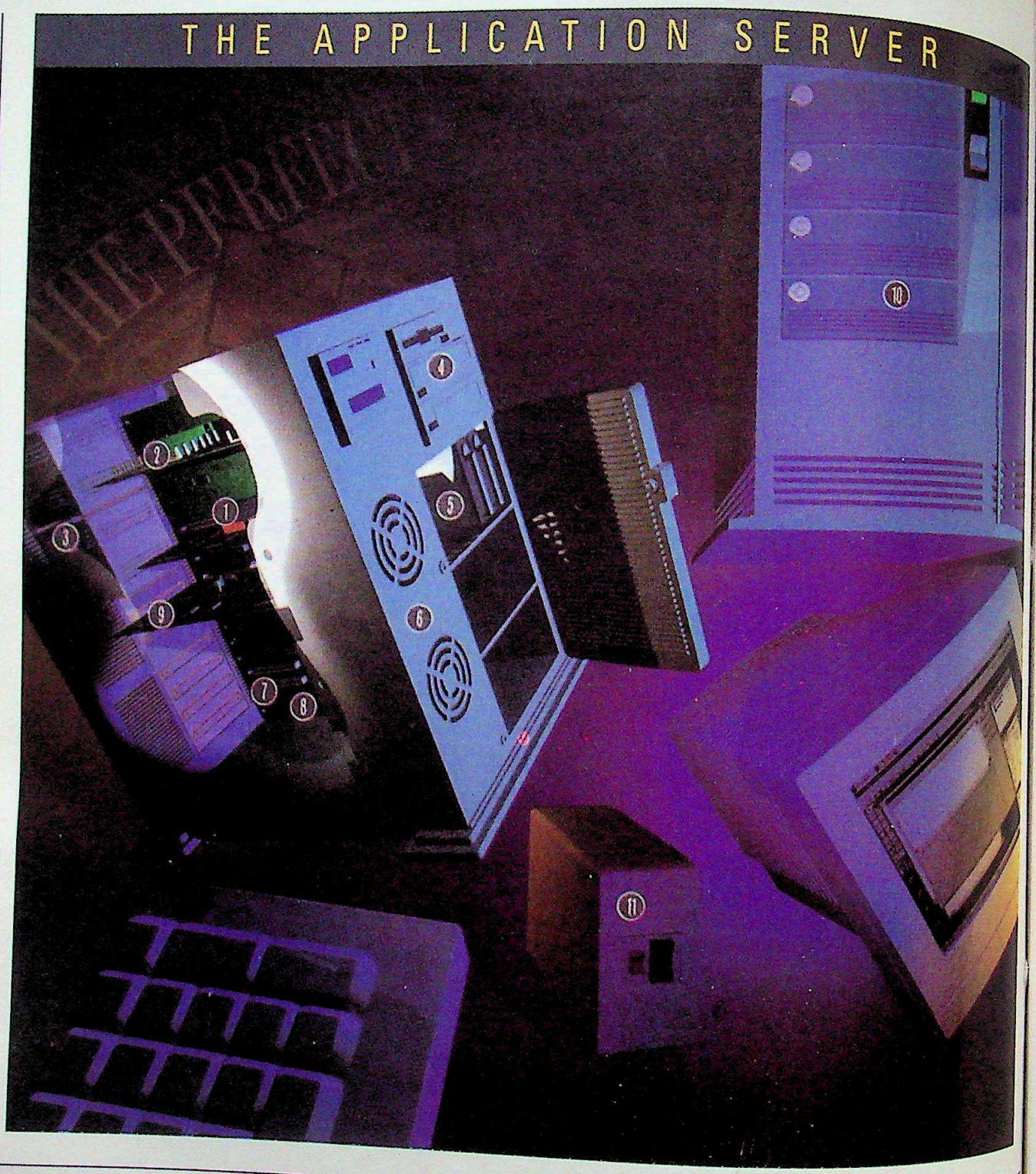
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MAXIMUM POWER

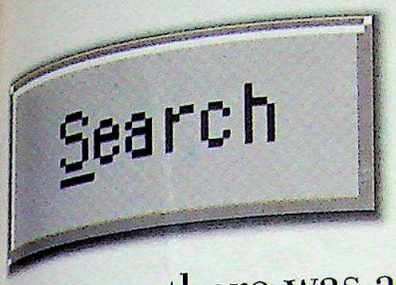
Mission-critical applications demand a server with capacity and redundancy to spare. Server-management software is also essential. The configuration below should easily support 120 clients or more.

Price (without external RAID array): $40,000 to $50,000.

1. **Two or four 200-MHz Pentium Pro CPUs** with 512K integrated L2 cache per CPU.
2. **256MB error correction code memory.**
3. **Redundant power supplies.**
4. **4X CD-ROM and 4-mm DAT drives.**
5. **Hot-swappable,** lockable hard disk subsystem; 16GB total disk capacity.
6. **Redundant fans:** Two or three, hot-swappable.
7. **A bridged PCI bus design** will provide a maximum of five or six PCI slots for add-in cards.
8. **Integrated Fast/Wide SCSI-2 controllers.**
9. **10/100-Mbps** PCI Fast Ethernet adapters.
10. **An external RAID** level 5 subsystem provides the best protection for large volumes of critical data.
11. **UPS** that will support the server's power consumption for at least 20 minutes.

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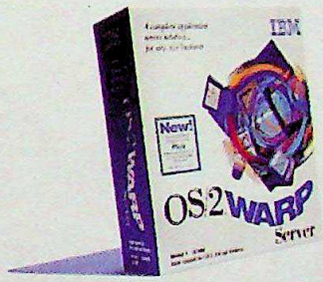
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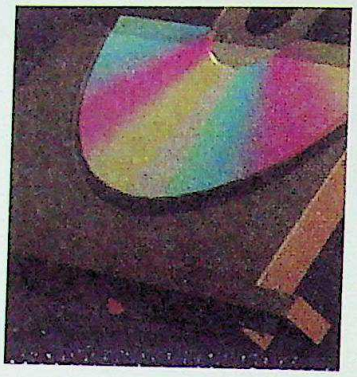
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The Perfect Components

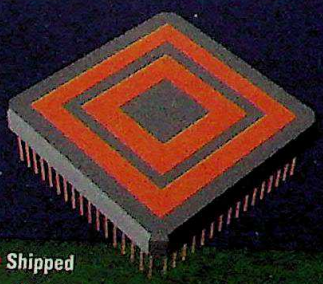


Now that you have a bird's-eye view of our Perfect PCs, it's time to delve deeper into the components that make up these systems. In this section, we examine virtually every major component that goes into a computer today, explaining the technologies behind the components and testing the competitors head-to-head to see which ones live up to the promises of their marketing sheets.

Our coverage starts with the basics: the perfect processor, memory, and motherboard. In the memory section, PC Labs tests the most popular types of both main memory and processor cache memory to see which combinations give you the best system performance for your dollar. We also examine the perfect peripheral bus, from Enhanced IDE and SCSI to up-and-coming technologies, including the Universal Serial Bus and IEEE 1394 (code-named *FireWire*).

Next, we look at the perfect graphics accelerator and monitor, as well as the perfect CD-ROM drive—with a speed shootout among ATAPI and SCSI 4X, 6X, and 8X devices. Then we move into the mass-storage arena for a discussion of hard disks, as well as look at different types of removable media, including CD-R drives, magneto-optical devices, and tape-backup devices. This section concludes with the perfect speakers and sound cards, which will help you set up your perfect-sounding multimedia machine.

CPU TIME LINE



- Shipped
- Announced
- Announced but not shipped

February 1993
- 50-MHz Sun SuperSPARC

March 1992
- 100-MHz MIPS R4000

September 1992
- 150-MHz Digital Alpha 21064

October 1992
- 50-MHz Sun MicroSPARC

March 1993
- 60-, 66-MHz Pentium

June 1993
- 150-MHz MIPS R4400

July 1993
- 200-MHz Digital Alpha 21064

August 1993
- 60-MHz Sun SuperSPARC

October 1993
- 50-, 66-, 80-MHz IBM PowerPC
- 85-, 110-MHz Sun MicroSPARC II

March 1994
- 90-, 100-MHz Pentium
- 60-, 66-MHz NexGen Nx586
- 66-MHz Digital Alpha 21068
- 166-MHz Digital Alpha 21066

June 1994
- 75-MHz MIPS R4000
- 133-MHz MIPS R4600
- 200-MHz MIPS R4400

July 1994
- 225-MHz Digital Alpha 21064A
- 275-MHz Digital Alpha 21064A

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THE PERFECT Processor

By Richard Fisco • A processor is the heart of the PC. Without it, you have nothing but a collection of parts that add up to an expensive paperweight. The CPU you choose can give you the power to run games, compute spreadsheets, and run 3-D applications—even motion video—faster than ever before.

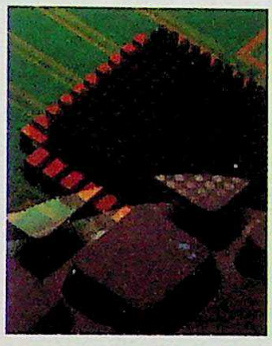
For many, today's top choice is a Pentium-class CPU. No 486-class CPU is powerful enough to warrant a new purchase, no matter how cheap it may be. The Pentium Pro is a good bet for the future: It gives optimum performance with 32-bit operating systems and applications, but with 16-bit OSs and applications, it performs roughly on a par with Pentiums. In this section we'll discuss the pros and cons of today's CPUs and take a peek at the future as well.

INTEL: REIGNING CHIP KING

The leading supplier of microprocessors today is Intel, by far. The vendor's sheer size, manufacturing capabilities, and engineering prowess make it the undisputed champ. Even with this lead, though, Intel does not sit still in the area of product development. New processors appear from Intel about every 18 months, and in between, the company keeps tweaking the performance of existing chips with die shrinks and faster clock speeds.

Intel's fifth-generation CPU, the Pentium, is currently the mass-market leader for desktop and notebook PCs. The Pentium gains its performance edge with features like superscalar design, an on-chip floating-point unit, and a 64-bit system bus. To enhance its position, Intel also manufactures core-logic chip sets and motherboards.

Intel's sixth-generation chip, the Pentium Pro, is its performance leader. This chip's architecture is very different from that of the Pentium: The Pentium Pro is *superpipelined* (its pipelines are deep and multistaged), and it uses what Intel calls *dynamic execution* (a speculative, out-of-order design) to enhance performance. The Pentium Pro contains the same amount of Level 1 (L1) cache as the Pentium—8K instruction and 8K data—but a feature unique to the Pentium Pro is the inclusion of Level 2 (L2) cache in the same package. The Pentium Pro comes with either 256K or 512K of four-way, set-associative L2 cache. Since the cache is on-chip, it runs at the CPU speed, and performance is much faster than with off-chip L2 cache.



The Pentium Pro's design allows it to perform at nearly twice the speed of a Pentium at the same MHz level when running 32-bit applications under a 32-bit OS. With 16-bit apps and OSs, however, the Pentium Pro performs only on a par with a Pentium of the same clock speed. This occurs because certain instructions will cause the Pentium Pro's pipeline to stall. Some compilers can deal with this situation, but with handwritten assembly code (as is found in portions of Windows 95), partial register stalls are more common. The result? The Pentium Pro performs at its best with a full 32-bit OS, such as Windows NT or OS/2 Warp, not Windows 95.

CYRIX: SERIOUS CONTENDER

Intel may rule in sales of PC processors, but there's a chink in its armor. Cyrix has developed its Pentium-pin-compatible 6x86 (formerly code-named M1) processor, denoting a comparison to sixth-generation chips like the Pentium Pro. According to our tests, Cyrix can claim the crown for Windows 95 performance, but it is not a serious challenger to the Pentium Pro.

In our recent review of the first Cyrix 6x86 PCs , the 6x86 P166+ was the top-performing *x*86 CPU under Windows 95. But when we ran 32-bit apps under Windows NT and OS/2, the tables were turned: The 6x86 performed on a par with the Pentium on tests involving integer calculations, and the Pentium beat the 6x86 on tests with floating-point calculations.

The 6x86 takes a more straightforward

March 1995
- 120-MHz Pentium
- 200-MHz Sun UltraSPARC I
- 166-, 233-MHz Digital Alpha 21066A
- 300-MHz Digital Alpha 21164

April 1995
- 110-MHz IBM PowerPC 601

May 1995
- 90-MHz MIPS R8000

June 1995
- 100-, 120-, 133-MHz IBM PowerPC 604
- 133-MHz Pentium

July 1995
- 100-MHz Cyrix CX5x86
- 250-MHz MIPS R4400

October 1995
- 100-MHz Cyrix CX6x86 (P120+)
- 143-, 167-MHz Sun UltraSPARC I
- 150-MHz IBM PowerPC 604

November 1995
- 150-MHz Pentium Pro
- 120-MHz Cyrix CX5x86 (P90+)
- 133-MHz AMD5K86 (P75)

- 120-, 133-MHz NexGen Nx586 (P120 and P133)
- 120-MHz IBM PowerPC 601

December 1995
- 300-MHz Digital Alpha 21064A
- 333-MHz Digital Alpha 21164

January 1996
- 150-, 166-MHz Pentium

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approach to operations than other processors. It doesn't convert code to RISC-like instructions; instead, the 6x86 operates on non-uniform-size *x*86 code (in "native" *x*86 mode) more efficiently than other CPUs do. The use of superpipelined architecture, register renaming, data dependency removal, branch prediction, and speculative execution gives the 6x86 its performance edge.

Indeed, the 6x86 runs at a slower clock speed than a corresponding Pentium: The Cyrix 6x86 runs at 133 MHz, but it's called the P166+. This naming convention comes as an answer to a dilemma that Cyrix, as well as rival AMD, faced: They both offer chips with slower clock speeds than the Pentium's yet with similar performance levels. Their achievements had made megahertz meaningless, but how could they convey this to the end user? AMD, Cyrix, IBM, and SGS-Thomson answered the question by joining forces to create the *P-Rating Specification.* This spec is meant to gauge the performance of their CPUs relative to that of the Pentium.

To generate the P-rating, the vendors use Ziff-Davis's Winstone 96 benchmark test program under Windows 95. They run Winstone 96 on identically configured PCs (except, of course, for the CPU) and compare scores. If a competitor's score is within 1.5 percent of the corresponding Pentium's score, then it earns a rating equivalent to that of the Pentium.

Since Cyrix does not own a fabrication plant, it relies on chip manufacturers with excess capacity. Currently, Cyrix contracts with IBM and SGS-Thomson to produce the 6x86. As part of the agreements, both companies have the right to sell 6x86 parts bearing the IBM or SGS logo.

Multimedia extensions to new CPUs will radically change the x86 architecture.

AMD: PLAYING CATCH-UP

AMD is also bidding for a piece of the microprocessor pie. The vendor was early to announce its Pentium-equivalent chip (code-named the K5), but the chip's initial release was delayed, because its performance was not up to the levels AMD wanted. AMD found that some *x*86 instructions were used more frequently than had been thought and the K5 wasn't optimized to handle those—thus dragging down the c... performance. This situation allo... Cyrix to get a jump on AMD.

AMD has now released the K5, c... ing it the AMD5K86. The chip sha... design feature with the Pentium Pr... converts *x*86 code to RISC-like op... tions, which AMD calls RISC ... (ROPs). Employing other features ... cluding a superscalar design, out-... order speculative execution, dyna... cache, line-oriented branch predict... and a 16K instruction and an 8K d... cache, the 5K86 looks like a v... challenger to the Pentium. For n... however, this is only speculation, as ... *Magazine* has yet to test a PC wi... 5K86 CPU.

The 5K86's initial offerings wi... at the 75-MHz and 90-MHz levels ... will compare with the Pentium o... clock-for-clock basis; they will also ... pin-compatible with the Pentium ... the third quarter of 1996, AMD ... offer 5K86 chips that run at 100 M... or faster, with performance enhan... ments in place to overcome the p... lems that had delayed the initial ... lease. The P-ratings of these chips ... expected to be above the rated c... speeds.

One more competitor, NexG... would have appeared here, but it ... recently bought by AMD, and produ... tion of NexGen's chips was discon... ued. NexGen had the first true Pentiu... competitor in its Nx586, but it had ...

February 1996
- 166-, 180-, 200-MHz Pentium Pro
- 110-, 120-, 133-MHz Cyrix CX6x86 (P133+, P150+, P166+)
- 200-MHz MIPS R5000

March 1996
- 75-, 90-MHz AMD5K86
- 200-MHz MIPS R10000

April 1996
- 166-, 180-MHz IBM PowerPC 604

June 1996
- 200-MHz Pentium
- 366-, 400-MHz Digital Alpha 21164

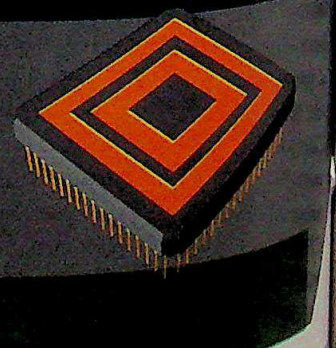
Second quarter 1996
- 100-MHz AMD5K86 (P100); CPUs with higher P-ratings are expected from AMD by the end of the year

FUTURE:

Third quarter 1996
- 250-MHz Sun UltraSPARC II
- 300-MHz Sun UltraSPARC II
- IBM PowerPC 620

By the end of 1996
- 120-, 133-MHz AMD5K86 (P150)
- 150-MHz Cyrix CX6x86 (P200+)
- Intel P55C with MMX

First half 1997
- Intel Klamath (Pentium Pro)
- Cyrix M2
- AMD K6



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many handicaps to overcome: The Cx5x86 was not pin-compatible with the Pentium (so it required special motherboards and chip sets); it lacked an on-chip floating-point unit (FPU); and supporting PCI chip sets were late to market.

MULTIMEDIA ENHANCEMENTS

Forthcoming multimedia enhancements will radically change the *x*86 architecture. Intel has already introduced its multimedia extensions (MMX) to the x86 instruction set—the first major change to the instruction set since the 386. MMX will boost performance on many audio, video, and image-processing applications. Intel will include MMX on its next Pentium processor (code-named the P55C), with systems expected at year's end.

To enhance the P55C, Intel will include a larger L1 cache (16K instruction, 16K data). The chip will also be a 2.5-volt part, as opposed to the current Pentium's 3.3 volts. The lower voltage and higher performance will make the P55C ideal for notebook PCs as well as for desktops.

Certainly AMD and Cyrix are not going to stand still. AMD has recently signed a five-year cross-licensing deal with Intel to acquire the rights to MMX technology (as well as to Intel's instruction set). Look for AMD to implement MMX in its next-generation K6 CPU. Cyrix will also wait until it introduces its next-generation chip, the M2, to implement multimedia extensions (which should be Intel MMX-compatible).

CHIPS OF THE FUTURE

Intel has two variants in the wings to supplement the Pentium Pro: Klamath and Deschutes (these are code names). Klamath is rumored to have a larger L1 cache than the Pentium Pro and no internal L2 cache. Like all new Intel CPUs from now on, it will incorporate MMX technology. Moving the cache off-chip will make the part cheaper to manufacture and give vendors more flexibility in system/cache design. Deschutes will likely be a 0.25-micron version of Klamath and have a lower supply voltage, making it a good candidate for portables.

Next up for Cyrix is the M2, which will probably be called 7x86. Based on the M1's core, the M2 will include higher clock rates and multimedia extensions. It appears Cyrix will start sampling in late 1996 and begin production in early 1997.

Clearly, AMD purchased NexGen for two reasons: for the design of the NexGen 686 (which will become AMD's K6) and for NexGen's experienced microprocessor design team. Performance enhancements to the K6—including improved out-of-order execution, an integrated low-latency FPU, and Intel-compatible multimedia extensions—could make this chip the first serious challenger to the Pentium Pro. AMD is scheduled to begin production in early 1997.

HOW TO DECIDE

Deciding which processor is right for you means asking two questions: What do you want to do with your PC today, and where do you want to go with it over the next two to five years? Intel's Pentium is the market leader, but if you run only Windows 95, the Cyrix 6x86 can give you a small performance edge—for now. Of course, this scenario changes under Windows NT; here the Pentium Pro is the performance leader. With the planned addition of MMX technology, the Pentium Pro's performance is only going to improve. For now, the only choice for a top-performing, workstation-class, *x*86-based PC with Windows NT is Intel.

Without tested parts, it's hard to tell, but 1997 is shaping up as a shoot-out among Intel's P55C and Klamath, AMD's K6, and Cyrix's M2. Keep an eye on the competition, but rest assured that Intel will be king of the mountain for the foreseeable future.

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THE PERFECT Memory

By Margaret Piemonte • Memory: We know we have it, and we know we need it. We've heard that the more a PC has, the better its performance will be. This section will explore the different types of main memory (called DRAM, or dynamic random access memory) and processor cache memory (called Level 2 or L2 cache) available for a PC today. By varying the amounts and types of DRAM and L2 cache in your system, you can get different performance returns.

As CPU speeds increase, so does the need for faster system components. Traditionally, the memory bus runs much slower than the CPU. But with Intel's newest PCI chip sets, the 430HX and 430VX, faster memory technologies can be implemented, closing the gap between the speed of the memory bus and the speed of the CPU.

FAST PAGE MODE: A DYING BREED

Fast-page-mode (or FPM) DRAM used to be standard issue on mainstream PCs. But the market has recently seen a surge in the availability of newer and faster memory types, which have all but succeeded in displacing FPM DRAM as the memory of choice.

FPM-memory read accesses begin with the activation of a row in the DRAM array, then move on to the activation of the first column of a memory address location that contains the data that you want. Each piece of information needs to be validated, then the data needs to be latched back to the system. Once the correct piece of information is found, the column deactivates and gets ready for the next cycle. This introduces a wait state, because nothing is happening while the column is deactivating. (The CPU must wait for the memory to complete the cycle). The data output buffer is turned off until either the next cycle begins or the next piece of information is requested. In fast page mode, the next column in the row activates in anticipation of the fact that the next piece of data you need is in the memory location adjacent to the previous piece. This activation of the next column works well only with sequential reads from memory in a given row.

Ideally, a read from 50-nanosecond FPM memory can achieve a burst cycle timing as fast as 6-3-3-3 (6 clocks for the first data element, followed by 3 clocks each for the next three data elements). The first phase includes the overhead created by activating the row and col... Once they have been activated, the ... ory can transfer the data in as few as ... clock cycles per piece of data.

EDO DRAM

Extended data out (EDO, sometimes called hyper-page-mode) DRAM and *Burst EDO* (BEDO) DRAM are two memory technologies based on the fundamentals of page-mode memory. EDO was introduced into mainstream PCs about a year ago and has since become the most memory of choice for many system vendors. BEDO is relatively new and has not yet caught the market's attention to the extent that EDO has.

EDO works much like FPM DRAM. A row of memory is activated, and then the column is activated. But when the piece of information is found, instead of deactivating the column and turning off the output buffer (which is what FPM DRAM does), EDO memory keeps the output data buffer on until the next column access or next read cycle begins. By keeping the buffer on, EDO eliminates wait states, and burst transfers happen more quickly.

EDO also enjoys a faster ideal burst read cycle timing than FPM DRAM: 6-...

SYSTEM PERFORMANCE

Memory and L2 Cache

PC MAGAZINE LABS

	No L2 cache	256K asynchronous L2 cache	256K pipelined-burst L2 cache	512K pipelined-burst L2 cache
ZD WINSTONE 32				
8MB fast-page-mode DRAM	30	35	37	38
8MB EDO DRAM	35	35	39	39
16MB fast-page-mode DRAM	57	70	88	91
16MB EDO DRAM	67	73	91	94
ZD CPUMARK32				
8MB fast-page-mode DRAM	167	220	271	303
8MB EDO DRAM	212	232	303	326
16MB fast-page-mode DRAM	168	224	288	323
16MB EDO DRAM	212	236	312	331
	BETTER	BETTER	BETTER	BETTER

We tested on a Dell OptiPlex 5166 (Pentium/166) PC with a 2GB hard disk and a Number Nine Imagine 128 graphics card.

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versus FPM's 6-3-3-3. This ultimately
ves three clock cycles in a burst of four
a elements from DRAM on a 66-MHz
EDO is easy to implement, and with
ally no price difference between fast
e mode and EDO, there is no reason
to choose EDO.

ST EDO DRAM

EDO DRAM improves cycle times over
M much more than EDO does. Since
st PC applications access memory in
ur-cycle bursts to fill cache memory (sys-
m memory will burst its data into L2
che, or to the CPU in the absence of L2
che), once the first address is known, the
xt three can quickly be provided by the
RAM. The essential enhancement that
EDO offers is the addition of an address
unter on the chip to keep track of the
xt addresses.

BEDO also adds a pipelined stage that
lows the page-access cycle to be divided
to two components. For a memory read
eration, the first component accesses
e data from the memory array to the
tput stage (second latch), while the sec-
d component drives the data bus from
is latch at the appropriate logic level.
ce the data is already in the output
ffer, faster access time is achieved.
EDO can achieve a maximum burst tim-
g of 5-1-1-1 (with 52-ns BEDO and a 66-
Hz bus), saving an additional three clocks
er optimally designed EDO memory.

NCHRONOUS DRAM

tel's 430VX chip set supports a new
pe of memory technology called *syn-
ronous* DRAM (SDRAM). A key fea-
re of SDRAM is its ability to synchro-
ze all operations with the processor
ock signal. This makes the implementa-
on of control interfaces easier, and it
akes column (but not row) access time
icker. SDRAM includes an on-chip
rst counter that can be used to incre-
ent column addresses for very fast burst
cesses, similar to BEDO's. This means
at SDRAM allows new memory access-
s to be initiated before the preceding
access has been completed.

SDRAM can achieve a burst timing
of 5-1-1-1 with a 66-MHz bus in a well-
designed and well-tuned PC. The
SDRAM's burst length and latency are
fully programmable via an on-chip mode register.

PROCESSOR CACHE

When we read about cache, we are usually reading about Level 2 cache, or external cache. L2 cache has been the domain of a very fast and expensive memory type called *SRAM* (static RAM) that holds data frequently used by the CPU so that the CPU doesn't have to rely solely on slower DRAM. Since fast types of DRAM are available, some vendors offer cacheless PCs to hit a lower price range. Through our testing, however, we've found that the performance levels achieved by cacheless PCs can't match the performance of a PC with L2 cache.

EDO has displaced FPM DRAM as the memory of choice in most PCs today.

The simplest form of SRAM uses an *asynchronous* design, in which the CPU sends an address to the cache and the cache looks up the address, then returns the data. An extra cycle is required at the beginning of each access for the tag lookup. Thus, asynchronous cache's response time can be as fast as 3-2-2-2 on a 66-MHz bus, although 4-2-2-2 is much more common.

Synchronous cache buffers incoming addresses to spread the address-lookup routine over two or more clock cycles. SRAM stores the requested address in a register during the first clock cycle. During the second, it retrieves the data and delivers it. Since the address is stored in the register, synchronous SRAM can then receive the next data address internally while the CPU is reading the data from the previous request. Synchronous SRAM can then "burst" subsequent data elements without receiving and decoding additional addresses from the chip set. Response time can be reduced—optimally—to a 2-1-1-1 timing on a 66-MHz bus.

Another type of synchronous SRAM is called *pipelined burst*. Pipelining essentially adds an output stage that buffers data reads from the memory locations so that subsequent memory reads are accessed quickly, without the latency incurred by traveling all the way into the memory array to get the next data element. Pipelining works most effectively with sequential access patterns, such as cache linefills.

PERFORMANCE RESULTS

Standardizing our test-bed was the key to consistent results. We used a Pentium/166 PC, from Dell Computer Corp., with an Intel 430FX chip set, a Seagate 2GB Fast ATA-2 hard disk, and a Number Nine Imagine 128 graphics card. To ensure a consistent set of test criteria, all of the memory used for our tests was supplied by a single company, Kingston Technology Corp. (*http://www.kingston.com*).

The most significant change in performance in all the testing scenarios was the increase in Winstone 32 scores when a machine's EDO DRAM was raised from 8MB to 16MB. Conversely, there was very little or no change in performance in $CPUmark_{32}$ scores in the same scenario, because CPUmark stresses the CPU, L2 cache, and memory speeds.

The numbers also show little performance gain in Winstone 32 scores when comparing fast-page-mode DRAM to EDO with any amount or type of cache. When there is no L2 cache, however, EDO shows its biggest performance gain over FPM: 15 percent with 8MB and 18 percent with 16MB.

For a machine with 16MB of EDO DRAM and no L2 cache, a big performance boost was achieved by adding 256K of pipelined-burst L2 cache: 47 percent on $CPUmark_{32}$, and 36 percent on Winstone 96. In general, adding cache or changing from asynchronous to synchronous pipelined-burst cache will result in a bigger increase in CPU/memory performance (as measured by $CPUmark_{32}$) than in overall system performance (as measured in Winstone 32).

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THE PERFECT Motherboard

By Richard Fisco • A motherboard is more than just a place to put a processor. Engineers must consider which components will be used and where they will be placed, as well as how connections should be made. Trade-offs must be considered. In other words, no single "perfect" motherboard exists.

In this section, we'll explain the most common technologies to give you an overall picture of what's necessary to formulate the perfect motherboard and to point out key things to keep in mind when purchasing a new PC. We'll focus here on Pentium-class motherboards, chip sets, bus speeds, and BIOSes. (See "The Motherboard" on the right, which illustrates how the new ATX motherboard design should help with layout problems.) Memory, cache, buses, and microprocessors are covered in separate sections of this story.

TWO DESIGNS

The ATX motherboard specification developed by Intel should eventually displace the long-used Baby-AT design. ATX's more efficient use of space and cheaper four-layer design provide a win-win situation for system vendors. ATX and Baby-AT boards are approximately the same size, but the ATX board is rotated 90 degrees within the PC's case, allowing easier access to internal components. The downside: ATX's four-layer design likely won't support bus speeds above 66 MHz.

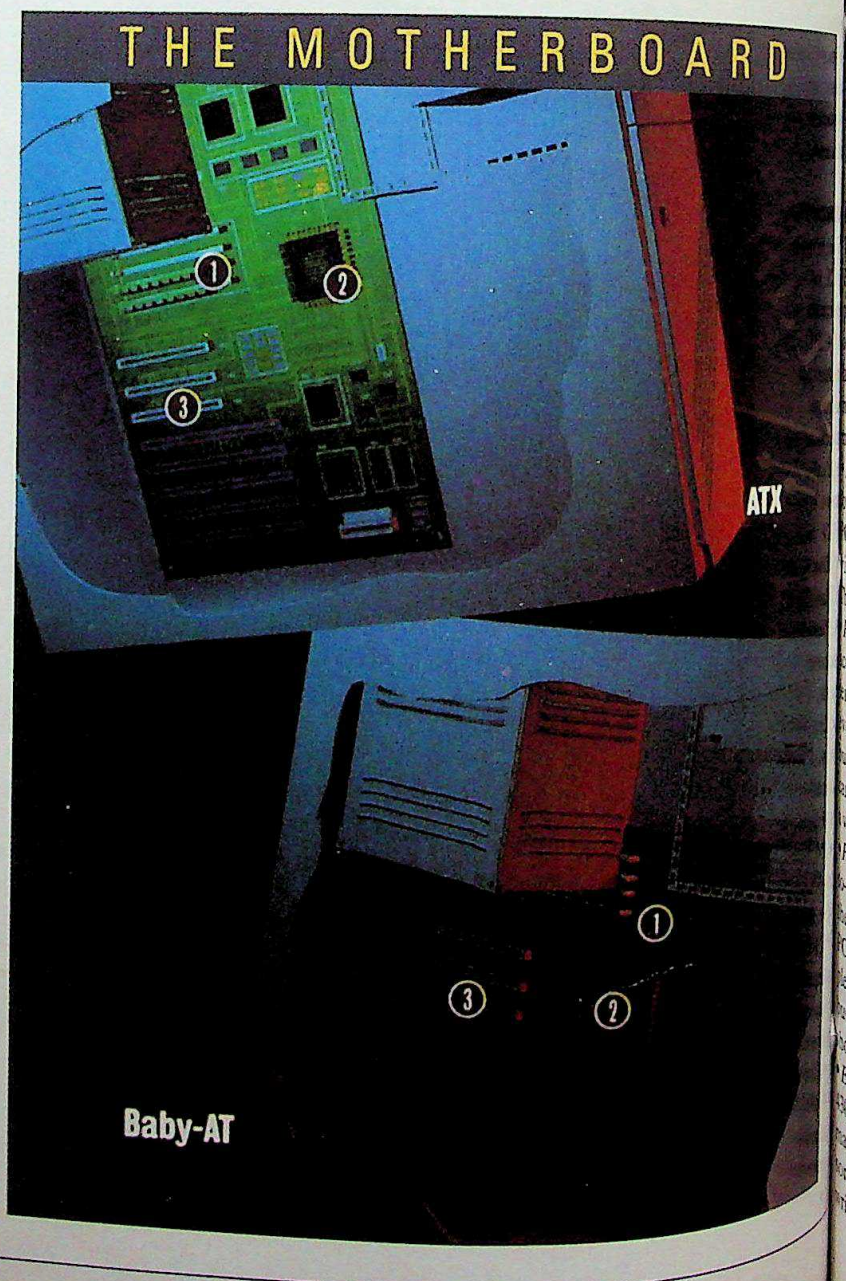
1. **Memory slots:** Usually blocked by power supply on Baby-AT boards. ATX boards give clear access.
2. **Processor socket:** Often blocks expansion slots on Baby-AT boards. Moved up and out of the way on ATX boards.
3. **PCI and ISA expansion slots:** Positioned opposite CPU in Baby-AT design; some full-length cards might be unusable. Repositioning of the CPU socket in ATX design allows for use of all expansion cards, regardless of size.

CHIP SETS

If the CPU is the heart of a PC, then the chip set is the pacemaker. Chip sets control the memory I/O, the bus I/O, and, in many cases, the integrated IDE hard disk controllers. They also handle interrupt requests (IRQs) and direct memory accesses (DMAs).

Many chip sets are available, but Intel-manufactured chip sets are by far the most popular. The most commonly used Intel chip set, the 430FX (formerly known as Triton), is soon to be replaced by the and improved 430HX and 430VX chip (formerly the Triton II). The HX chip se marketed for business PCs, while the V chip set is meant for home and small-b ness PCs. Each offers a 64-bit me path, concurrent PCI, and the 82371SB I/O IDE Xcelerator. The 82371SB supp the Universal Serial Bus (USB), as w PIO (programmed input/output) and b mastering IDE, and it is PCI 2.1–comp

The HX chip set also supports u 512MB of main memory, dual process



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...d ECC memory. The VX chip set differs ...om the HX in that it supports up to only ...MB of main memory and also supports ...chronous DRAM (SDRAM).

...IA's VT82C580VP Apollo-VP chip ...for Pentium PCs has specifications sim...r to and in some cases exceeding those ...Intel's 430HX chip set. The Apollo chip ...which is PCI 2.1–compliant, supports ...to 512MB of memory, Unified Memo... Architecture (UMA), concurrent PCI, ...cache burst timing rates of 3-1-1-1, ...SB, and PIO and bus-mastering ...E. It also supports burst EDO ...EDO) and up to 2MB of L2 ...che, as well as the Cyrix 6x86 ...PU's linear burst mode.

Pentium-class chip sets are also ...ailable from OPTi (the OPTi ...per) and VLSI (the VLSI 500 se...es), although we've seen very few ...stems with either chip set in our ...ainstream PC roundups.

...NCURRENT PCI

...e implementation of concurrent ...CI in Intel core-logic chip sets ...rmits more efficient operation ...CPU, PCI, and ISA transactions for ...ster and smoother multimedia perfor...nce. Concurrent PCI implements four ...chanisms to improve performance:

...Multi-transaction timer (MTT). This al...s bus-mastering PCI cards to hold the ...CI bus and perform short data bursts ...thout having to re-arbitrate for the bus. ...at should help video performance.

...Passive release. By allowing interleaved ...cess to the bus by CPU and PCI mas...rs, the PC can continue transactions ...en when an ISA transaction owns the ...s. Passive release should allow audio ...rds to use fewer system resources when ...video clip is running.

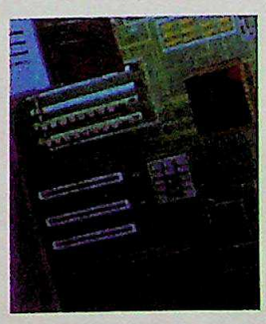
...PCI delayed transaction. When a PCI-...-ISA transaction is held in the chip set, ...e bus masters are then free to use the ...CI bus, and the ISA transaction is com...eted later. This allows the PCI and ISA ...ses to be used more efficiently and ...ould yield smoother video playback.

...Enhanced write performance. The ...30HX and VX chip sets' write perfor...nce is better than that of their predeces...rs because of the use of deeper buffers, ...rite merging, and faster retire to DRAM. Because of the larger buffers, write cycles will have less of an impact on system performance. Write merging collects byte, word, and Dword cycles and combines them into a single write to DRAM.

SYSTEM BIOSES

The system BIOS (basic input/output system) is the piece of code typically residing on the programmable read-only memory (PROM) chip that all PCs need to operate. The BIOS runs a power-on self-test (POST) when you first turn on the PC, and it controls keystroke interpretation and port communication. Although there are many different BIOS vendors, differences among their products are few.

Look for a BIOS that supports Plug and Play (PnP) and power management. PnP is desirable, though not required, if you plan to use Windows 95. Without a PnP BIOS, your system is not fully PnP-compliant, and features such as power management and add-in card auto-detect may not work. If your company buys computers with Energy Star certification, the BIOS must have power management support. Your BIOS should support both system and monitor suspend and sleep modes.



The adjustability of performance settings, such as DRAM read/write timings, varies with the BIOS. Usually, the motherboard or system vendor will have set the timings for optimal performance. So for the most part, it is best to stick with those settings unless you are absolutely certain that faster timings will improve your PC's performance without causing problems.

BUSES

Motherboards have many buses: the memory bus, cache bus, ISA bus, and PCI bus. Although today's Pentium-class CPUs run at clock speeds of 75 to 200 MHz, the memory and cache are limited to 50, 60, or 66 MHz. The memory subsystem's running speed is called the *motherboard speed,* and the processor is clock-multiplied to run from 1.5 to 3 times as fast.

The disparity between CPU and memory subsystem speeds creates a bottleneck, especially at high CPU speeds. To help alleviate the problem, the motherboard speed must be increased to 75 MHz and beyond. It's not an easy task: At 75 MHz, electromagnetic interference (EMI) becomes a significant problem. Cyrix has stated that it is working on a 75-MHz motherboard with a third party, but this design has yet to be seen.

The difference between a 66-MHz and a 60-MHz bus may seem slight, but the speed delta trickles down. The PCI bus divides down using the motherboard clock, as shown in the chart. So though it may appear that a 120-MHz PC should be only slightly slower than a 133-MHz unit, in reality, the combination of slower CPU, memory subsystem, and PCI bus makes a Pentium/120 barely faster than a Pentium/100.

The *Universal Serial Bus* (USB) is a new bus designed to provide a single interface to connect mice, joysticks, keyboards, and telecommunications devices. USB's powered hub operates at 12 megabits per second (for devices such as printers that need their own power supplies), while a secondary, low-speed channel runs at 1.5 Mbps (for mice and keyboards).

USB allows you to daisy-chain up to 127 devices, similar to the way the Macintosh is set up today. But don't look for the serial, parallel, and game port connectors to go away all that soon. Literally millions of mice, joysticks, printers, and modems in use rely on those connectors.

Bus Speeds by Processor

Processor speed (MHz)	Memory and cache bus speed (MHz)	Processor multiplier	PCI bus speed (MHz)
75	50	1.5	25
90	60	1.5	30
100	66	1.5	33
120	60	2	30
133	66	2	33
150	60	2.5	30
166	66	2.5	33
200	66	3	33

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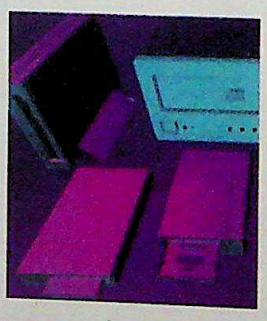
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THE PERFECT Peripheral Bus

By James Karney • Selecting the right peripheral bus is a key element in designing the Perfect PC. This communications channel between a computer and its components plays a major role in how well a computer performs—and what it costs.

The simple bus for storage device is *ATA/EIDE* (AT Attachment/Enhanced Integrated Drive Electronics). It can run up to four devices at a respectable speed, and, since the late 1980s, most users have found it adequate for everyday computer needs. EIDE lets us add two hard disks, CD-ROM drives, and tape backup units with little fuss. Almost every new motherboard comes with two IDE interfaces built in, so the cost is almost nonexistent.

Like the old VGA cards, EIDE devices let the computer's CPU do most of the work. But over the years improvements have been made, raising the theoretical upper throughput performance limit from the original 3.3 MBps (megabytes per second) to 16.7 MBps, though we've reached only about half of that in actual use. That sounds great, but EIDE is a drain on the CPU and must use kludgey methods to handle large hard disks or demanding peripherals.



When it comes to theoretical speed and the number of devices supported, *SCSI* (Small Computer Systems Interface) is the king of the hill. Most devices available today are built to the SCSI-2 specification. *Fast SCSI* uses an 8-bit data path and a transfer rate of 10 MBps. *Fast/Wide SCSI-2* delivers 20 MBps on a 16-bit bus. The latest flavor, *Ultra Wide SCSI-3*, has an upper performance limit of 40 MBps. Like modern Windows display adapters, SCSI host adapters improve performance by taking over tasks from the CPU. Most can do more than one job at a time, and they improve throughput by ordering the way events are handled.

Using current-generation business applications in a real-world scenario, it is hard to see any remarkable performance advantage of SCSI over EIDE. Older 16-bit operating systems could only do one thing at a time. And while OS/2, Windows 95, and Windows NT are true multitasking, multithreaded environments, most apps don't yet take full advantage. So for most users, there is no clear advantage to SCSI; EIDE is perfectly adequate and cheaper. SCSI is preferable for users with many devices connected to their PCs, and it holds the potential—not yet proved, however—that it could provide better performance with 32-bit operating systems and applications.

SCSI does come out on top in the number and scope of devices it can connect. A single card can connect up to seven devices per channel, with up to three channels. Virtually all CD-R drives, scanners, and RAID arrays work only with SCSI interfaces. If you need more speed, more hard disk space, or plan to connect several devices, SCSI is the way to go. Most adapters will add about $100 to $300 to a system's cost.

Later this year the equation will start to change as two new peripheral bus technologies enter the marketplace. While the transition may take several years, the days of traditional EIDE and current SCSI technology are numbered. The *Universal Serial Bus* (USB) is a 12-Mbps (megabit-per-second) standard for connecting equipment like keyboards, monitors, input devices, and cameras (as many as 64 devices) to a PC. It will probably be too slow for good hard disk performance and hence may be coupled with advanced EIDE on low-end machines.

On the high end, *IEEE 1394* (sometimes referred to by Apple's trademark name, *FireWire)* is a high-speed serial SCSI standard that is getting a lot of attention. It has all the advantages of the current SCSI interface and excellent throughput: It will allow transfer rates from 100 to 400 Mbps, and some designers are forecasting that when optimized it could run up to 1.6 Gbps. The first devices to use 1394 are digital video cameras and the like, where throughput is important.

If you plan on buying a new low-cost system this year with little more than hard disk and a CD-ROM

Current status

INTERNAL I/O BUSES

ISA
Since 1984, ISA has been the ubiquitous internal interface. Its 8-MHz speed and 3-MBps bandwidth make it suitable for modems and other low-speed devices.

EISA
With its 33-MBps transfer rate and 8.33-MHz bandwidth, EISA was used for high-end SCSI adapters and graphics cards but has fallen out of favor, except on a few servers.

VL-Bus
This 133-MBps burst 33-MHz bus was designed primarily for early high-performance Windows graphics adapters and storage devices.

PCI
This 133-MBps, 33-MHz bandwidth design, tuned for fast CPUs, was the successor to VL-Bus and EISA. It incorporates the best of both and then some. It's the best solution today for high-speed storage, graphics adapters, and network cards.

EXTERNAL I/O BUSES

EIDE
The least expensive way to hook up hard disks, CD-ROM drives, and tape units to a PC. EIDE. It boosts performance over older IDE, giving 13.3 MBps at 13.3 MHz (theoretical).

SCSI
The preferred way to connect the widest range and number of devices, both external and internal, SCSI allows up to seven devices per channel, at up to 40 MBps at 20 MHz. It's the choice for servers, RAID installations, and high-performance storage devices.

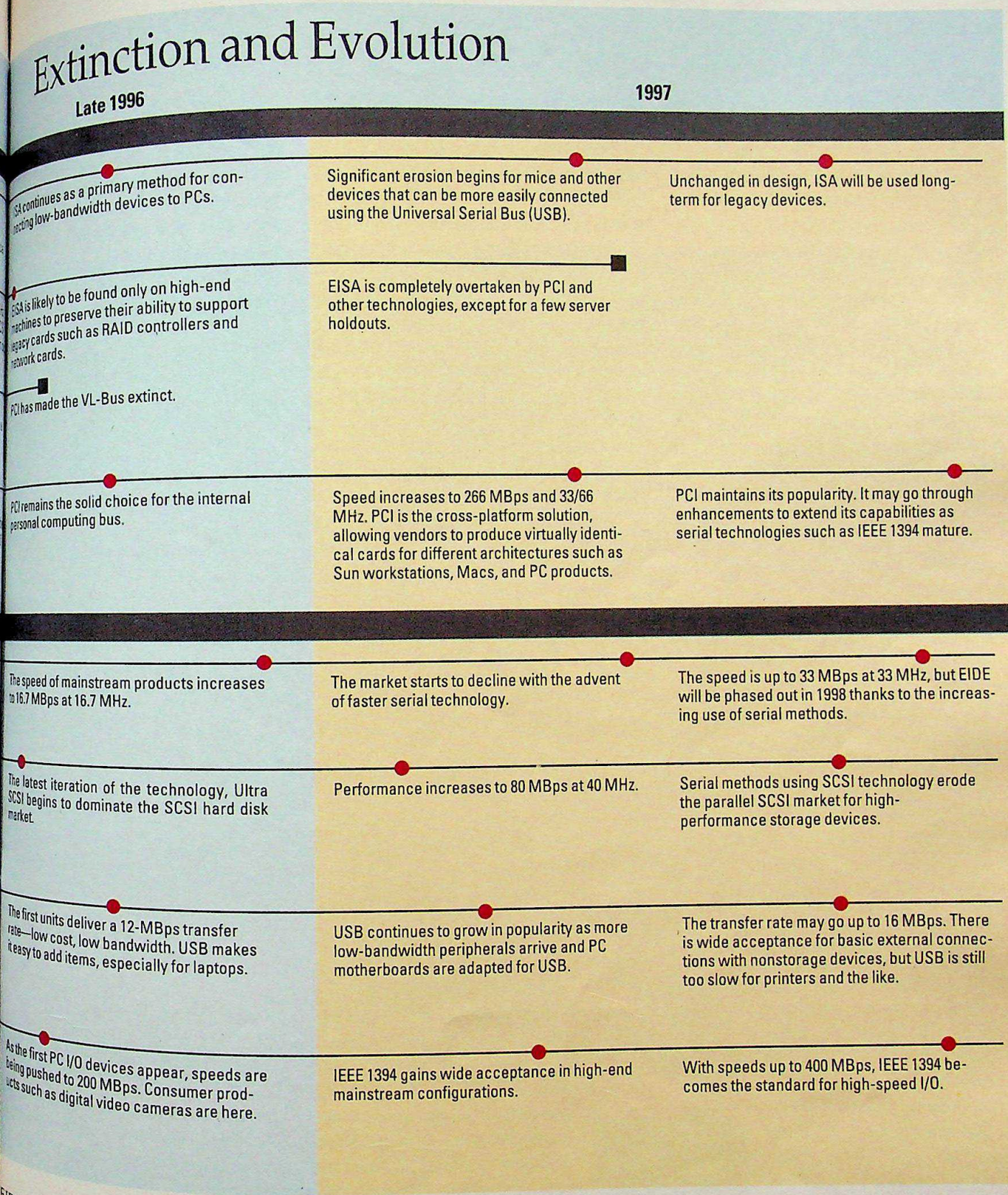
USB (Universal Serial Bus)
USB is the up-and-comer for attaching monitors, input devices, page scanners, and other devices to a PC. USB-enabled PCs have appeared, but drivers and peripherals won't arrive until the end of 1996. A variation may allow low-cost hard disk connections.

IEEE 1394 (FireWire)
A SCSI serial technology still under development, this high-speed interface can handle live and recorded video I/O. With its inexpensive design and 100-MBps bandwidth, it will soon be used for hard disks, scanners, printers, and digital video devices.

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Extinction and Evolution



EIDE has the cost advantage. More complex systems call for SCSI's ability to connect and manage more devices.

ON THE INSIDE

The dominant internal bus in PCs today—and for the foreseeable future—is *PCI* (Peripheral Component Interconnect). With its 133-MBps maximum throughput and Plug and Play compatibility, PCI has proved ideal for high-performance devices such as hard disks, graphics accelerators, and network cards.

Since its introduction in late 1993, PCI has steadily taken the reins from the competing high-performance technology, *VL-Bus*—which should be all but extinct by the end of this year. Another competing architecture, *EISA* (Enhanced ISA), will also fall by the wayside as PCI continues to improve.

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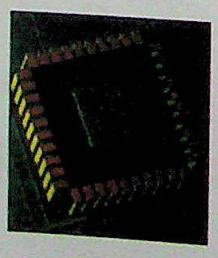
THE PERFECT Graphics Accelerator

By Jeff Mace • Choosing the perfect graphics accelerator for the type of work you do can increase the overall performance of your system. These internal peripherals come in many flavors, so choosing the right one will require a little homework.

Each of today's graphics adapters includes the same integral parts. The *graphics controller,* for example, accelerates the GDI (graphics device interface) calls that your application generates as you work. Otherwise, GDI calls would have to be processed by your CPU and the Windows 95 DIB (Device Independent Bitmap) software accelerator, or the Windows NT GDI, or the OS/2 Presentation Device Driver. The board's *driver*, which provides the interface to the operating system, hands these calls to the graphics controller, which transforms the binary fonts, lines, pictures, fill colors, and whatever else needs to be presented to the screen into *pixels*, or picture elements.

The controller then sends the pixel information to the card's on-board RAM, the *frame buffer*. The new screen image is laid out and stored there according to the *x, y* grid that resembles the 2-D resolution of the screen. Next it is accessed, many times a second, by the *RAMDAC,* which converts the computer-generated digital pixels to the RGB (red-green-blue) analog signal that the monitor requires.

RAM is expensive, so you should calculate the amount of RAM you need based on the *resolution* (screen-image size) and *color depth* (number of colors) you choose to work in. A simple formula does this. Multiply the horizontal resolution by the vertical resolution, then multiply that answer by 1 for 8-bit color, by 2 for 16-bit color (65,000 colors), or by 3 for 24-bit color (16.7 million colors). For example, to work at 640-by-480 resolution with 256 colors (an 8-bit color depth), you would need 308K of memory on the board. To work at a 24-bit color depth, you would need three times the memory, or approximately 1MB, since you need a little extra space for off-screen memory tasks such as caching recently used bitmaps or fonts.



The most popular business resolutions today are 800-by-600 (SVGA) or even 1,024-by-768 for those with a 17-inch monitor. A little math quickly tells us that the perfect graphics board would need at least 2MB of RAM for the frame buffer to deliver 16-bit color at 1,024-by-768. If you want to run at 24-bit color or if you plan to move to a higher resolution down the road, you're best off looking for a board that lets you upgrade memory beyond 2MB later on. Graphics professionals who work with image-editing packages at even higher resolutions—up to 1,600 by 1,280 pixels—probably need a board with 6MB of RAM or more.

The perfect graphics board would need at least 2MB of RAM to deliver 16-bit color at 1,024-by-768.

POTENTIAL BOTTLENECKS

The bus connection provides the data entry point to the graphics board. Your purchase is restricted to the type of bus supplied on your PC's motherboard. While many graphics boards come in ISA, VL, and PCI bus formats, all the newer, faster products come only in PCI. With PCI, graphics controllers can use such features as bus mastering and Plug and Play support.

The width of the data path used by the graphics controller can introduce the next bottleneck. Most controllers today can accept 64 bits of data per clock cycle, or 32 bits per cycle when only 1MB of memory is present on the board. Once the data is on board and processed by the graphics controller, it needs to make the rounds to the frame buffer, then RAMDAC. Anything less than high-speed transfers here can bind up the process. Several memory designs and new graphics processors with memory controllers designed to work with these new memory types widen bandwidth and increase overall throughput.

MEMORY 202

Inexpensive entry-level boards use standard *DRAM* (dynamic RAM) or the newer EDO (extended data out) DRAM, which improves throughput by allowing the next memory cycle to be initiated before the previous cycle begins to finish, the same in your PC. But DRAM's single-port read/write port will always have trouble keeping up when color depths are higher than 8 bits per pixel. At higher color depths DRAM is limited in its ability to act as frame buffer, receive writes by the graphics controller, and simultaneously be read by the RAMDAC for refreshing the screen.

Since users will want to set their graphics board's screen refresh rate to at least 72 or 80 Hz to obtain a crisp, flicker-free display, *VRAM* (video RAM) memory designs offer a second read-only port dedicated to serving the RAMDAC. The similar *WRAM* (Window RAM) aids 2D bit performance through its support for aligned BitBlts. Other such memory designs are available, and newer ones seem to be coming out all the time. For instance, *SGRAM* (synchronous graphics RAM) has a block write capability similar to that of VRAM, which allows you to perform accelerated area fills and accelerated painting, and there are new types of DRAM, such as *SDRAM* (synchronous DRAM) . The newest advanced memory type is Rambus, which enables very high on-board data transfers through a simple 32-pin interface to the memory controller.

MORE ADVANCED FUNCTIONALITY

Chances are you'll be working with video in some form if you have a CD drive, so the perfect graphics board should handle video. In its simplest form, processing motion video means processing a succession

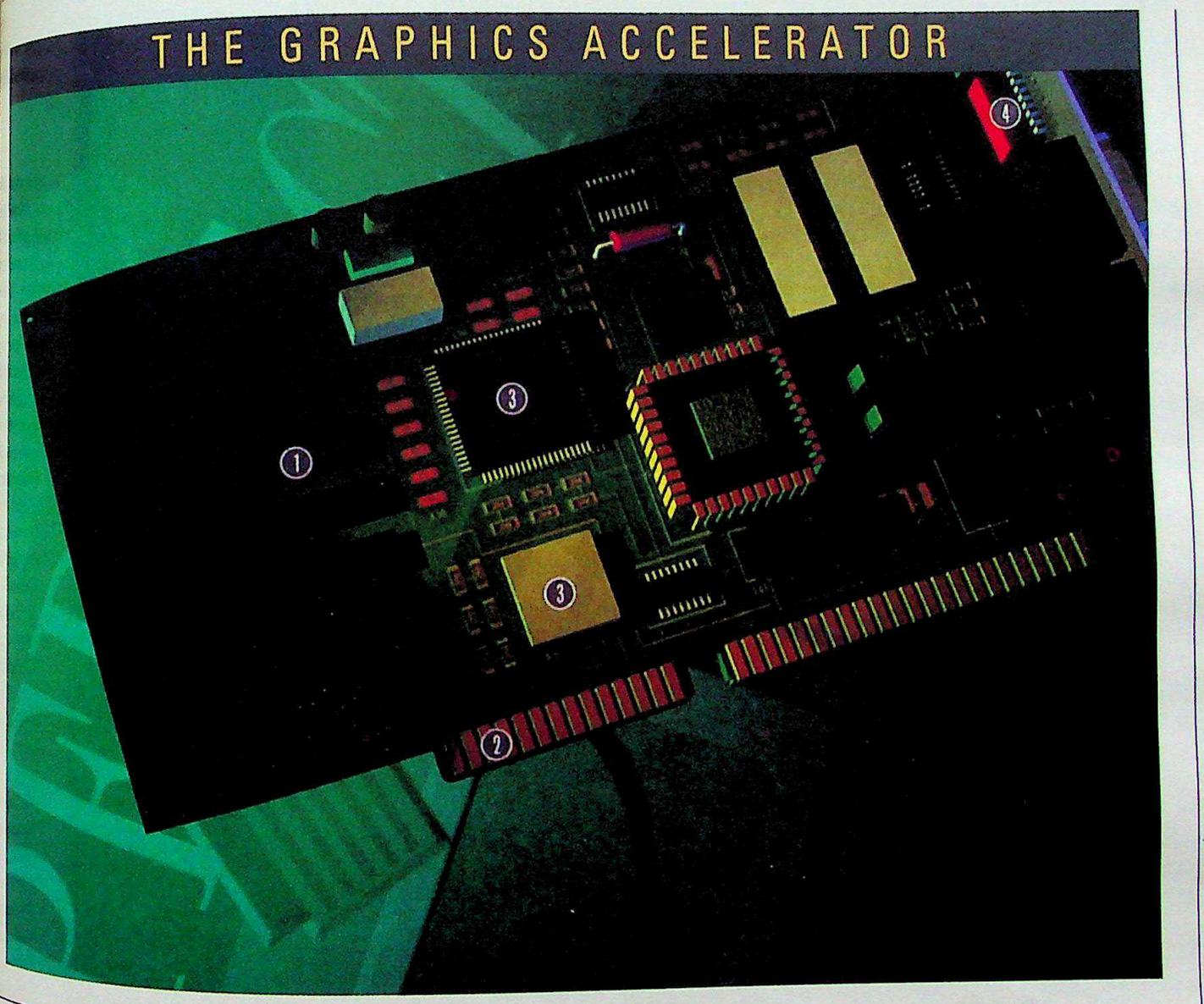
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bitmap data at 15 to 30 frames per second (which makes the moving video appear real). This is a daunting task even for graphics board with a dual-ported memory design. Look for a board that offers motion video acceleration and scaling, preferably with video-acceleration functions rolled into the controller.

3-D processing is the newest challenge for mainstream graphics boards. Like video processing, it will be rolled into many of the new boards. A 3-D processor will be responsible for applying the shading, or "skin" onto the wireframe geometry that represents the 3-D image. The mainstream boards won't rival the $2,000 cards aimed at CAD and animation pros, but they should prove fine for games and business apps with 3-D features.

Finally, look for a board that delivers creature comforts, such as rock-solid Windows 95, OS/2, or Windows NT drivers, and added features that let you easily set the refresh rate and switch resolutions.



RESOLUTION AND REFRESH RATE

For rock-solid images on the 17-inch display, make sure your graphics card can deliver 1,024-by-768 resolution at a refresh rate of at least 80 Hz. The card must also have dedicated drivers and utilities for the operating system you use, with features such as on-the-fly resolution switching. Price: $300.

1. **2MB RAM.** The average business user needs 2MB of EDO DRAM. A graphics workstation requires 4MB to 8MB of VRAM or WRAM.

2. **PCI bus, data path.** The newest, fastest cards provide PCI connectivity for better performance. Also, look for a card with a 64-bit data path.

3. **MPEG and 3-D.** To assist in decoding MPEG video and accelerating Direct 3D–compatible games and applications, look for MPEG-1 playback and 3-D hardware acceleration.

4. **Feature connector.** You may eventually want to upgrade and buy an optional daughtercard such as an MPEG-2 decoder or TV tuner, so be sure the card supports these.

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THE PERFECT Monitor

By Jamie M. Bsales • The monitor is the most-used part of your PC system, the part you interface with every moment you work at your machine. But too many people skimp when it comes to the display, either settling for the budget 14-inch monitor that came with their system or trading up to only a 15-inch unit. Home PC users who use their machines only a few hours a week may indeed want to stay with a more affordable—and less space-hungry—14- or 15-inch display. But business users who spend all day on their PCs will find the larger display worth the investment: The right monitor can make you more productive; the wrong one can cause headaches, fatigue, and eyestrain.

STOP SCROLLING AROUND

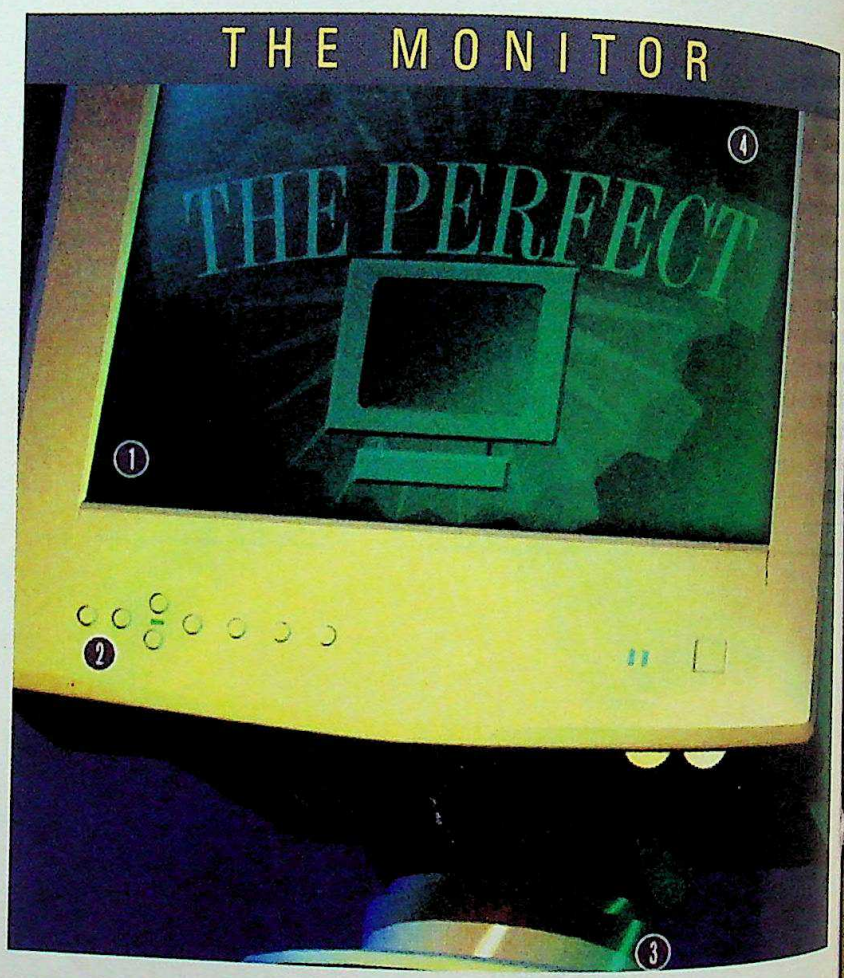
If you're buying today, the perfect monitor to purchase is a 17-inch unit (the size of the tube, measured diagonally). Note that the ads and packaging for monitors may say "17-inch class," followed by a figure—about 15.5 inches—that denotes the actual viewable area. Computer CRTs do not produce a picture edge-to-edge, so a 17-inch tube yields a smaller live area. Prices have been trending downward steadily for years, and an excellent 17-inch display can be had for about $750.

The increase in screen real estate means that you can set your monitor for a higher *resolution*—the size of the screen image, measured in pixels—and have more application windows accessible at once or see more of a large spreadsheet. You wouldn't want to run at a resolution above 800-by-600 on a typical 15-inch monitor, for example; the fonts and icons would appear too small. But a 17-inch monitor will let you work comfortably at 800-by-600, and most users will find 1,024-by-768 quite acceptable.

Next, make sure the monitor you choose supports a high *vertical refresh rate* at the resolution you intend to work in. Refresh rate is the number of times per second the screen image is redrawn. If a monitor runs at a low refresh rate (below 70 Hz), you will be able to see the screen flickering. This can be uncomfortable at least and at worst could lead to headaches and eyestrain. VESA (the Video Electronics Standards Association) recommends a refresh rate of 75 Hz or better, and that may soon increase to 80 Hz. So to ensure that the monitor is easy on your eyes, look for a refresh rate of at least [illegible] Hz at 1,024-by-768 resolution.

TUBE TYPES

Your next decision point is what type CRT you prefer. *Shadow mask* tubes, which have been around since the birth



SIZE AND REFRESH RATE

The optimal monitor for a business user is a 17-inch unit that delivers 1,024-by-768 resolution at a refresh rate of at least 80 Hz. This will let you have multiple windows (or a large spreadsheet) viewable at once and ensure there is no noticeable flicker that could cause eyestrain.

Price [illegible]

1. **Mask pitch.** A mask pitch of 0.28mm or less should mean a sharp image.
2. **On-screen controls.** An intuitive interface that lets you change a range of image attributes is a must. Extra controls that give instant access to brightness and contrast are a plus.
3. **Universal Serial Bus.** Debuting at the end of 1996, a USB-equipped PC and monitor will let you easily connect compatible peripherals.
4. **Tube type.** Most users will be happy with a shadow mask or slot mask tube; graphics artists might want to try an aperture grill monitor.

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...levision, use a mask with small holes to ...ver each red, green, and blue pindot of ...lor. These masks vary in *dot pitch*, the ...ce between two dots of the same color, ...asured in millimeters. Generally, the ...aller the dot pitch, the sharper the ...reen image. We recommend a shadow ...sk CRT with a pitch of 0.28mm or less.

About ten years ago Sony introduced ...e Trinitron tube—an *aperture grille* de...gn—for PC monitors. This type of CRT, ...w also manufactured by Mitsubishi ...der the DiamondTron brand name, has ...mask with a vertical stripe pattern; its ...sk pitch is generally 0.25 to 0.30mm, ...ough it is difficult to correlate this figure ...ectly with the measurements given for ...aditional shadow mask designs. Aper...ure grille tubes are generally brighter, ...tter, crisper (and more expensive) than ...aditional CRTs, but they might prove ...tter for detailed work such as image ...iting and DTP. Note, however, that ...rline damping wires, used to support ...e mask, are visible if you look for them; ...me users might find this distracting.

Some monitor makers—most notably NEC—recently have tried to bridge the gap between the two types, offering so-called *slot mask* designs that combine attributes of aperture grille and traditional shadow mask designs. These tubes use an elongated mask opening instead of dots, and they don't need damping wires.

IMPORTANT DETAILS

Finally, the perfect monitor offers extras that make working with it a little easier. It should offer an intuitive on-screen utility that lets you change image attributes beyond simply brightness and contrast. A better monitor will let you correct for *pincushioning* and *barreling* (where straight lines tend to bow on-screen), as well as easily set the *color temperature* (how warm or cool the colors look). Another nice touch is a color management utility such as Colorific, which lets you match the colors you see on-screen to those produced by your color printer.

The perfect monitor also delivers compliance with the Display Data Channel specification (the newest being DDC2B), which enables two-way communication between the monitor and a DDC-compliant graphics adapter in your PC. DDC lets the monitor and graphics card determine the resolutions and refresh rates each is capable of and then configure itself optimally. By the end of the year we should start seeing monitors that offer a USB (Universal Serial Bus) interface. If your PC is so equipped, you will be able to use your monitor as a connecting point for a host of peripherals (including your keyboard and mouse), which is more convenient than having to plug and unplug devices from the back of your PC.

More and more monitors are coming equipped with built-in speakers, which can be an elegant solution to desktop clutter. If you use your PC sound capabilities predominantly for business audio—such as videoconferencing or telephony—then a speaker-equipped monitor is right for you. If you tend to play music or games, the sound quality of the vast majority of monitor speakers will disappoint.

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Jot down your response on a sheet of paper and mail it to the Editor, *PC Magazine India*, A39 NDSE Part II, New Delhi 110049.

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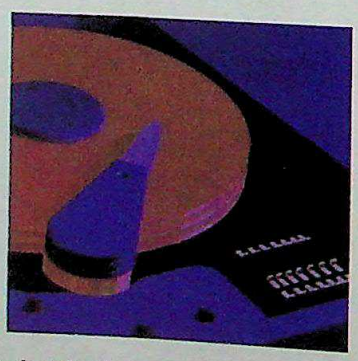
THE PERFECT

Hard Disk

By John Bryan • So you're in the market for a hard disk? Microsoft Windows 95 and its associated applications, Internet access and the graphical nature of many of the files there, and the simple fact that we are using our computers for more and more things dictates that most of us are in the market for a new drive, whether we realize it or not. After all, disk drives are like closet space: You can never have enough.

There have been a number of developments in this field lately, and new head technology, faster rotational velocities, and upgraded read-channel abilities are all contributing to a better product. The most important change for most buyers, though, has been price: Entry-level desktop system drives of 1 to 2 gigabytes are priced from about 20 cents to 25 cents per megabyte, depending on the interface and performance characteristics. These figures indicate that over the past five years the industry has managed an increase in capacity and corresponding drop in price of at least an order of magnitude.

Most new PC systems are shipping with drives of 1.2GB to 1.6GB in capacity, and just about every drive manufacturer is shipping drives in the 2GB to 8GB range for the OEM and retail channels. If you're looking for the perfect hard disk that has room to grow in the next 6 to 12 months, we recommend a 2.1GB drive, which should cost about $360 list.



Many PC buyers may be tempted to opt for an even higher-capacity drive, such as a 4GB unit, to ensure that they have enough capacity for the life of their PC. If you're buying the drive bundled with a new system configured at the factory, this might be a good choice. Users looking to upgrade an existing system—especially a 486 or earlier—should think again: The PC BIOS has some significant limitations with respect to hard disk usage, and these limitations can result in lost capacity, inefficient use of available space, or system lock-up upon installation.

PCs using the Windows operating system store data on their hard disks in a format called FAT, or File Allocation Table. (Windows NT and OS/2 can also use FAT format, but they also have their own more efficient formats, NTFS and HPFS, respectively.) The File Allocation Table uses a series of 16-bit pointers to keep track of what sectors of the disk are free, belong to a file, or are unusable for some other reason. The largest partition that the DOS FAT structure can see is 2.1GB (2,146,959,360 bytes). Hence, drives larger than this must be partitioned into smaller logical drives using DOS FDISK or a similar utility.

Trouble is, you must install the drive before you can create partitions, and most older BIOSes—drive makers estimate 90 percent of those in 486 and earlier machines—won't allow you to install such a drive. The BIOS will either recognize only a portion of the large disk (up to 2.1GB, if you're lucky) or lock up the system altogether. If your system has a flash, or user-programmable, BIOS, your PC vendor can probably supply a BIOS program version that will enable the use of larger than 2.1GB disks. Otherwise you will need a secondary program, generally available from either your hard disk vendor or a disk-support application vendor such as Storage Dimensions or Ontrack. The Windows 95 fix for this dilemma, FAT32, will begin appearing in preinstalled versions of the OS this summer; no plans to make it available to current users as an upgrade have been announced.

The second consideration after capacity is drive performance, largely determined by the rotational rate of the platters. Better disks for desktop PCs spin at 5,400 rpm (revolutions per minute). More cost-sensitive buyers may opt for a 4,500-rpm drive, which will deliver more than adequate performance.

A number of new developments—new head technology, faster rotational velocities, and upgraded read-channel abilities—are all contributing to a better product.

The *average seek time* is the time the drive takes to position the read head over the desired track. *Average access time* is a truer measure of performance, as this figure adds in the time it takes not only to seek out the right track but also to position the head over the proper sector on the track. Look for an access time of less than 18 ms (milliseconds).

Finally, be wary of manufacturers' claimed *data-transfer rates*—the rate at which data is written to or read from the platter. They may cite *internal data-transfer rates*, the speed at which the drive can take information off the platter and into internal buffers, which is much faster than the *external data-transfer rate*—the speed at which data is actually transferred to your system. The data transfer rate is determined largely by your drive/system interface. Depending on your system bus/drive controller support (whether PCI, ISA, or EISA) and the data-transfer mode used, data-transfer rates of 2 MBps (megabytes per second) to 20 MBps theoretically may be achieved across the bus interfaces; 5 MBps to 8 MBps is a more

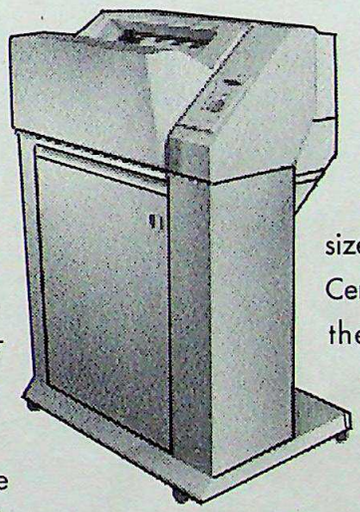
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realistic external transfer rate from a single SCSI or EIDE hard disk today. If your system is set up for a SCSI drive, it is generally best to go ahead and spend the extra money for a SCSI hard disk.

Until recently, all drive heads were *inductive thin-film* heads that flew over the drive platters for read and write operations. Heads themselves are still made using thin-film technology (like processors), but some don't fly anymore. Others are no longer inductive, at least in the read operation. *MR* (magnetoresistive) heads enable manufacturers to get much higher data capacities per platter. This means they can pack the same capacities onto fewer platters, eliminate parts, and, as the saying goes, pass the savings on to you.

Proximity, or *semi-contact*, heads ... after the same end, but use the appro... of taking the head so close to the pla... that it comes in contact with the surfa... significant percentage of the time. T... used to be anathema to drive manufac... ers, but improvements in micro-manu... turing technology have made it not o... possible but profitable.



CAPACITY & PERFORMANCE

To make sure that you have enough hard disk capacity for all your needs—e-mail threads, Web downloads, digital photos, video, and memory-hungry graphics applications—buy a 2.1GB drive. Price: $360.

1. **Three platters.** The three-platter design lets makers deliver 2.1GB in a 3.5-inch, half-height form factor. Some vendors offer a 5.25-inch form factor drive.
2. **Rotational speed.** Although 4,500 rpm is fine for most users, the best desktop drives spin at 5,400 rpm. High-performance 7,200-rpm units are available for audio/video use but may be too noisy and hot for a desktop PC.
3. **Interface.** If your system supports SCSI, the p... formance gain is worth the extra cost.
4. **Head-to-head.** New head technologies, s... as MR (magnetoresistive) and proximity (or ... deliver more capacity in less space.

Performance specs

- Look for an average access time of 18 ms or less. The ... internal data-transfer rate should be at least 5 Mbps.

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THE PERFECT

Removable Media

By Jamie Bsales • With removable mass storage, what is perfect depends on the user. Some types of storage drive stress low cost per megabyte, while others deliver quick access time and high data throughput. Some offer great portability, and still others boast shareability.

If you're looking for an inexpensive and easy way to back up your PC or a network server, tape is a good solution. These drives are available in internal and external units for individual PCs as well as jukebox configurations for networks. They are among the most affordable (as low as $150) and boast the lowest cost per megabyte of any mass-storage medium: as little as one-tenth of a cent. At the high end, 4-mm DAT (digital audio tape) and 8-mm tape drives each have long track records of reliability and are ideal for networked configurations. For the desktop PC or small server, the new *Travan* technology packs anywhere from 400MB to 4GB of data onto a tape, depending on the drive. The drawback is in performance: Since tape is linear, the drive must spin through the reel to reach the data you've requested; access time can be 30 seconds or more. So tape is best as a backup medium for files you rarely if ever need to access.

One of the hottest storage options these days is *CD-R*, or compact disk–recordable. These drives let you create your own CD-ROM disks (up to 650MB) from $7-apiece blank CD media. The drives have steadily been coming down in price and are available for as little as $500, though more typical prices range from $700 to $1,000. CD-R's allure is distributability: Because the vast majority of PCs come equipped with CD-ROM drives, you can create and distribute disks and be almost certain recipients can access the data. The capacity and relatively good performance—400-ms (400-millisecond) access time and 600-KBps (600-kilobyte-per-second) transfer rate—also make the disks ideal for multimedia presentations and training videos that would otherwise hog a hard disk. So far, though, CD-R software has been tough to work with for novice users, and the range of CD-ROM data types can be intimidating. But with a little practice (and a few wasted disks), most savvy users can be using CD-R for archiving, data distribution, and even creating their own audio CDs. The coming CD-E (compact disk–erasable) drives will let you rewrite disks.

A competing type of drive is Panasonic's *PD/CD-ROM drive* (about $5[illegible]). These drives can read standard CD-ROM disks, and they can also write (and rewrite) proprietary 650MB cartridges ($45 each). With an access time of 16[illegible] and throughput of 870 KBps, they are much faster than CD-R drives and are ideal for storing large, often-used files and even entire applications.

Another popular category is proprietary cartridge drives. Iomega's Zip dr[illegible]



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about $200) stores 100MB on each 3.5-inch cartridge ($15 apiece) and offers great portability for use with a laptop or for shuttling data between home and office. Iomega also offers its $500 *Jaz drive*. It can fit 1GB of data on each $99 cartridge. The *SyQuest EZ-135* (also $200) stores 135MB on each $20 cartridge, and it comes close to hard disk performance.

A possible threat to the Zip and EZ-135 comes from the next-generation floppy disk drive, the *LS-120*. Made by MKE, the floppy-disk-drive giant, and first incorporated into Compaq PCs, LS-120 drives can read traditional 1.44MB floppies, but they can also write new floppy disks that hold 120MB of information. Competing technologies are coming from other manufacturers, though, and it will be interesting to watch how this plays out.

Magneto-optical drives have been around for a while and are seeing a resurgence in popularity. MO drives come in two formats: 3.5-inch, with capacities to 230MB; and 5.25-inch, which can now write 2.6GB cartridges. Because of their excellent performance (20- to 50-ms access times and a 2-MBps transfer rate) and nearly indestructible media, MO drives are ideal for storing large amounts of frequently used data near-line.

If you need a cartridge drive system to shuttle files back and forth between your business and a service bureau (such as a prepress house), consider a drive like a 5.25-inch–format *SyQuest drive* ($350). These proprietary drives can fit 200MB or more of data per cartridge and are firmly entrenched in the desktop publishing and graphic-arts communities.

Looking forward, we can expect the coming DVD format to spawn *DVD-R*, perhaps by the end of next year. The successor to CD-R, DVD-R will let you create your own DVD disks to be read in DVD players, which should become standard over the next three to five years. These disks will hold up to 8.5GB on each disk and offer better performance than today's CD-R drives.



MORE SPACE

The choices for removable mass storage are many, and the list is growing all the time. Decide which attributes—transportability, shareability, speed, low cost per megabyte—are most important to you.

1. **Tape.** Sequential access makes it slow. But it's cheap per megabyte, and capacities are growing.
2. **CD-R:** Gaining in popularity thanks to the ubiquity of CD-ROM drives.
3. **Zip/EZ-135:** Very popular and reasonably quick; ideal for sharing or shuttling large files.
4. **PD/CD.** These dual-purpose drives can read CD-ROMs and write 650MB cartridges.
5. **LS-120.** This MKE/Compaq/3M device reads and writes 120MB and standard 1.44MB floppy disks. Competitors may emerge.
6. **Pinnacle Apex.** This proprietary-format MO drive promises 4.6GB capacity, though it has been vaporware for almost a year.
7. **DVD-R.** Still a couple of years away, these recorders will let users create DVD disks that hold up to 8.5GB on dual-layer disks.
8. **SyQuest drive.** Such proprietary-format cartridge drives are strong in the graphic-arts market.
9. **Magneto-optical.** Quick performance and durability of the media are the selling points.

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THE PERFECT CD-ROM Drive

By John R. Quain • When developers started using CDs as storage media, CD-ROM players had an average transfer rate of 150 kilobytes per second (KBps). When the second generation of 300-KBps drives emerged, they were referred to as double-speed (or 2X) drives, and the race was on. We moved from 2X to 4X drives with 600-KBps throughput, then to 6X drives and their superior 900-KBps performance. Last spring, CD-ROM drive makers pushed ahead with 8X drives boasting a whopping 1.2-MBps (megabytes per second) average throughput.

If you already have a 4X drive, don't worry about the Joneses. Multimedia disks, the most demanding CD-ROMs of all, are written only for 2X or 4X drives. So going faster won't increase the performance of video and audio until multimedia software titles are written specifically for the faster CD-ROM drives. And if you're looking for a bargain, 4X drives can be had for under $100 on the street.

If you're shopping for the *perfect* CD-ROM drive, however, we suggest you consider an 8X drive, which will start around $250. Large databases of information can be accessed more quickly with a faster drive, and the peak 1.2-MBps data-transfer rate of an 8X drive will help get the data to you faster. When more demanding CD-ROM titles do hit the ma-
ket, you'll be ready for them.

CD-ROM drive buyers will notice
prices vary by $100 or more among
speed drives. Some of the cheaper
posedly 8X drives are actually "pu
4X drives with revamped software
firmware rather than new drive me
nisms. These drives can be less reli
than full 8X drives. Unfortunately, th
no way for the typical buyer to tell, so
best to be suspicious of a bargain-pr
8X drive.

You might want to keep many C
ROM titles on your system at the s
time. You can do that with a CD-R
changer. These models can handle

PERFORMANCE TESTS

CD-ROM Drives

PC MAGAZINE LABS

The performance characteristics of 4X, 6X, and 8X ATAPI and SCSI CD-ROM drives tracked as expected. More interesting were the results for CPU utilization, where we saw differences across both speed and interface variables.

What the Numbers Mean

In most cases, drives with a SCSI interface used less of the CPU's processing power to perform our real-world operations, leaving the CPU greater freedom to handle concurrent tasks. Also, 8X drives, with their better throughput, were notably less resource-hungry than 6X drives, a fact that recommends 8X over 6X perhaps even more than the straight performance boost does.

How We Tested

The **Sequential Read** test measures a drive's sequential data throughput rate. Each drive reads our entire test CD in 16K blocks.

The **Access Time** test measures the time it takes a CD-ROM drive to position its read head over a randomly selected data sector and read a 2K sector at that location. The average stroke distance is one-third of the entire CD-ROM disk.

The **CD-ROM WinMark 96** test suite plays back CD-ROM operations from a profile of six of the most popular Microsoft Windows CD-ROM applications. The test takes the average transfer rate for each application and uses a weighted harmonic mean to calculate the average transfer rate for the PC's CD-ROM subsystem.

The video playback tests show performance and CPU utilization characteristics of a variety of CD-ROM video types.

	CD-ROM Sequential Read (Kilobytes per second)	CD-ROM Access Time (Milliseconds)	CD-ROM WinMark 96 (Score)	Intel Indeo Video (320 x 240 resolution, 30 fps, 600 KBps)			Cinepak Video (320 x 240 resolution, 30 fps, 300 KBps)			Cinepak Video (640 x 480 resolution, 30 fps, 900 KBps)		
				Audio breaks	Frames dropped	CPU utilization	Audio breaks	Frames dropped	CPU utilization	Audio breaks	Frames dropped	CPU utilization
ATAPI INTERFACE												
Hitachi 4X	612	244	424	0	0	62%	0	0	44%	5	454	98%
Hitachi 6X	1,080	168	672	0	0	60%	0	0	43%	0	0	83%
Hitachi 8X	1,220	159	735	0	0	54%	0	0	46%	0	0	68%
SCSI INTERFACE												
Plextor 4X	689	135	547	0	0	52%	0	0	40%	4	417	96%
Plextor 6X	910	153	613	0	0	56%	0	0	42%	0	18	93%
Plextor 8X	1,220	117	847	0	0	47%	0	0	36%	0	0	58%
	BETTER	BETTER	BETTER									

Lower scores represent better performance.

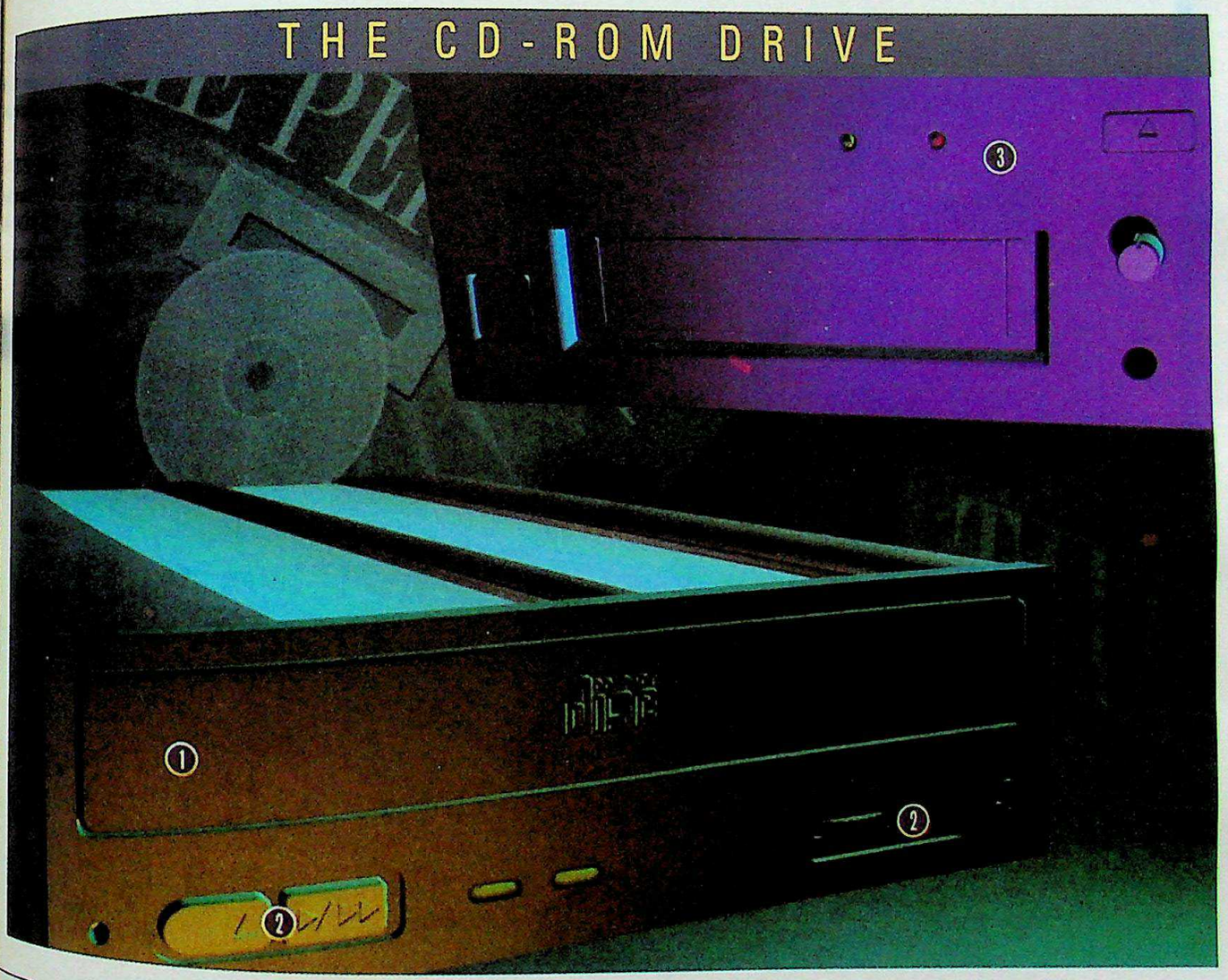
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five, six, or even seven disks at a time, but they run only at quad speed right now. If you're constantly swapping disks in and out of your CD-ROM drive, however, a (six)-4X changer could save you more time than a single-disk 8X drive.

Just as buyers start to ponder the 8X speed enhancements, some companies are announcing still faster—10X—drives. Pioneer New Media Technologies is expected to be the first out of the blocks with its Super 10X drive.

This fall, several manufacturers are expected to introduce new drives that can operate at 8X and play regular CD-ROM titles as well as disks containing 4.7GB of information—a huge leap over current 650MB CD-ROMs. DVDs (which has alternately stood for digital video disks and digital versatile disks) are the same diameter as current CD-ROMs, and the first drives for computers are expected to be priced in the $500 to $700 range. Should you wait for a DVD drive? The short answer is no. It will take months before software developers produce titles specifically for DVD, and because of the huge installed base of CD-ROM drives, they will doubtless continue to produce CD-ROM disks for years to come.



8X SPEED

Although 4X drives are sufficient to read the current crop of multimedia CD-ROM titles, if you're buying today, opt for an 8X drive to stave off obsolescence. A 4X multidisk changer may save you more time than a single-disk 8X drive.

Price: $250.

1 **True 8X.** If you find an 8X drive that seems too much a bargain, beware. Some vendors are selling 4X drives that have been speeded up to 8X specs, but these drives don't give true 8X performance in most real-world applications.

2 **Creature comforts.** Since you may also want to play audio CDs, look for a drive with play and track-skip buttons, as well as a headphone jack.

3 **Changers.** If you find yourself swapping disks often, consider getting a multidisk CD changer. Both internal and external drives are available.

Other important points:

- 2-MBps throughput. Gives speedy access to the CD-ROM–based information you may also want.
- On the horizon: The looming 10X and DVD drives mean we'll have to reconsider all of this a year from now.

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THE PERFECT Sound

By Holly Aguirre • Over the years, sitting down in front of a PC has become much more involved than simply using Excel spreadsheets and word processing. CD-ROM titles rich in sound, multimedia presentation creation, videoconferencing, and telephony, as well as such recreational activities as playing games and listening to audio CDs while you work, require that sound be an integral part of the perfect PC. To complement that much-toiled-over sales presentation or to download a sound bite of Homer Simpson, you'll want the perfect sound board. And gamers will delight in the new 3-D acoustic offerings.

BEYOND THE BASICS

Most PCs now come equipped with multimedia, and most PC vendors now include good-quality sound cards that deliver *wavetable synthesis.* Wavetable technology enables your computer to play back the prerecorded sounds of actual instruments. Cheaper boards often rely on *FM synthesis*, using programmed sine waves to produce less-than-believable instrument reproductions—the bleeps and bloops of last-generation arcade games or calliope-like musical passages. An on-board wavetable chip contains prerecorded, digitized samples of actual musical instruments and sound effects. The difference is obvious: Music tracks are more convincing and action games more intense.

If sound quality is important—say, for those who build multimedia presentations, compose music on their PCs, or use their machines for serious gaming—chances are you'll want to upgrade to a better card than the one that came with your system. This can be achieved for about $200 retail. For this investment you get true CD-quality stereo recording and playback using 44,100 16-bit digital samples per channel every second, better wavetable samples, and other extras.

The ability to support *General MIDI* (musical instrument digital interface) will prove an indispensable part of your perfect sound board. MIDI is a standard set of commands that can be issued by an electronic instrument (such as a keyboard) or an application (such as a game). The MIDI command tells the synthesizer which instrument to play, at what pitch, and for what duration. Since a MIDI command demands less storage than digitized sound files, it is prevalent in game and edutainment titles. But you'll need a MIDI-compatible card to be sure you're getting the sound the developer intended. Note that not all wavetable sample sets are created equal, however; the MIDI composition of a title or of your own making could be fine, but the wavetable samples delivered by a lesser sound card could be disappointing. Also, you'll want *Sound Blaster compatibility;* this Creative Labs specification is widely used in DOS games and is a must if you're a game player.

The hottest ticket in sound these days is so-called 3-D sound. Sound-card and speaker vendors have teamed up with companies such as Binaura Corp., Dolby, Q-Sound, Spatializer, and SRS to add dimensional effects to the sound being generated.

More business-oriented users may want to opt for a card that combines sound functionality with communications functions. With specialized chips called *DSPs* (digital signal processors), these combination cards provide basic PC sound while adding functionality such as telephony, fax, and voice mail. The newer configurations even integrate voice recognition and text-to-speech features, so you can control your computer via voice commands and retrieve your e-mail remotely. Keep in mind that you'll need the right software. There are many sound boards that simply focus on quality sound reproduction without extras, but they also use custom DSPs for special sound effects like echo, reverb, and flanging.

While most sound cards have a b... in amplifier, the signal is generally w... (only 4 watts per channel, with high ... tortion), even on better cards. T... means that the perfect sound syste... quires a set of self-powered spea... which have their own power source ... amplifier built in. Most of the "cour... speakers that come bundled with m... media PCs produce noise and distor... and the power amplifier will allev... this problem.

The best way to go is with a three-p... system: two small satellite speakers ... signed to handle mid- to high-range ... quencies (from 150 Hz to 20 kHz) a... separate subwoofer for lower frequen... (20 Hz to 150 Hz). The subwoofer p... duces the richer bass missing from a t... piece set of speakers. With its bread-... size, it can easily be hidden under y... desk. PC speakers are designed to prod... more directional sound; unlike reg... stereo components, they should be pl... closer to the user for better sound—ab... 2 feet away. Computer speakers are u... magnetically shielded to prevent any in... ference with your display.

PC speakers are a sexy item th... days, and you could easily spend $25... more. Unless PC sound drives your liv... hood, though, look for a set that del... 30 watts of power (enough to fill an ave... with sound without distortion) for ab... $150. Finally, look for features such as a... up-front headphone jack, volume a... balance controls, and bass and tre... knobs.

DIMENSIONAL SOUND

The hottest ticket in sound these da... so-called *3-D sound.* Sound-card a... speaker vendors have teamed up w... companies such as Binaura Corp., Dol... Q-Sound, Spatializer, and SRS to add ... mensional effects to the sound being g... erated. These effects serve to widen ... stereo field to give more depth to the ... herently shallow listening field of m... small, closely spaced PC speakers.

Most 3-D effects are caused by mix... specifically delayed versions of the ...

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...left/right channel outputs with the original signal, simulating reflections off walls, thus adding spaciousness and directionality to the sound. This approach is used by Aureal's Sensaura, Spatializer, and SRS. Even better are the sound effects of Dolby Pro Logic and Q-Sound, which let multimedia developers pinpoint sounds in space and move them around the listener. These effects must be programmed into the multimedia title, however, and you must have a sound card or speakers designed to deliver the desired effect. Those inclined to blast off into the universe after hours will enjoy the enhanced effects, but purists eager to hear every harpsichord note in a Mozart piece should probably stay away. □

THE SOUND BOARD & SPEAKERS



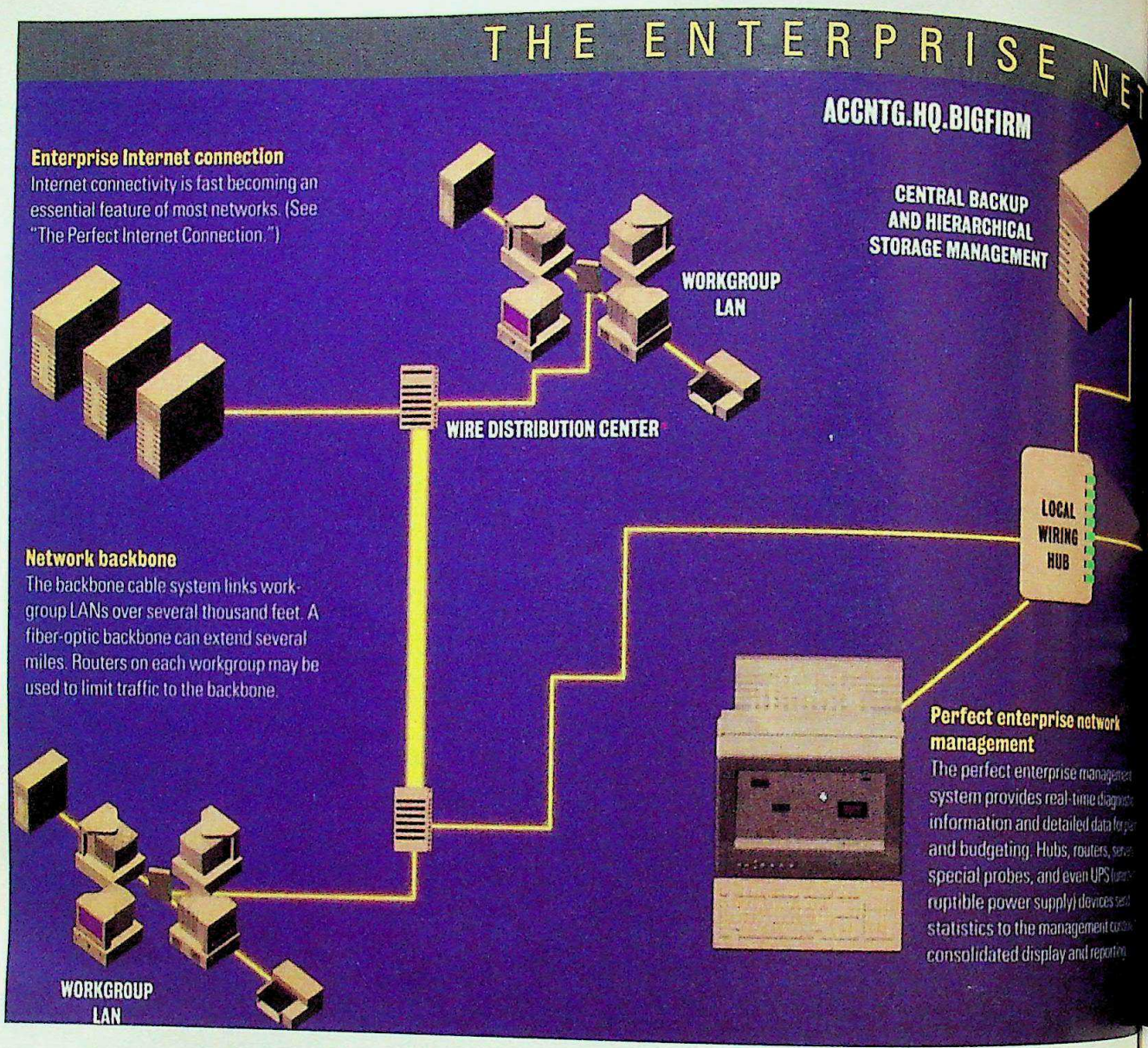
WAVETABLE *For realistic sound reproduction from multimedia titles, insist on a sound card with wavetable synthesis, not just the poorer FM synthesis.* Price: $200.

Your speaker set should include two satellite speakers and a subwoofer. Price: $150.

1. **True CD-quality stereo sound.** The card must deliver 16-bit 44-kHz stereo sampling
2. **Wavetable synthesizer.** The synthesizer should deliver 4MB of accurate, high-quality samples (compressed to 2MB of ROM).
3. **3-D sound enhancement.** Spatial effects can add depth to games and music.
4. **Digital signal processor.** An on-board DSP can add special features such as telephony.
5. **External connectors:** SCSI or IDE connector for CD-ROM drive and other peripherals.
6. **Powered speakers with subwoofer.** The set should have controls that are easy to manipulate; a mute button is a plus.

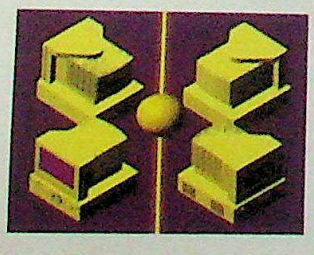
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The Perfect Connections

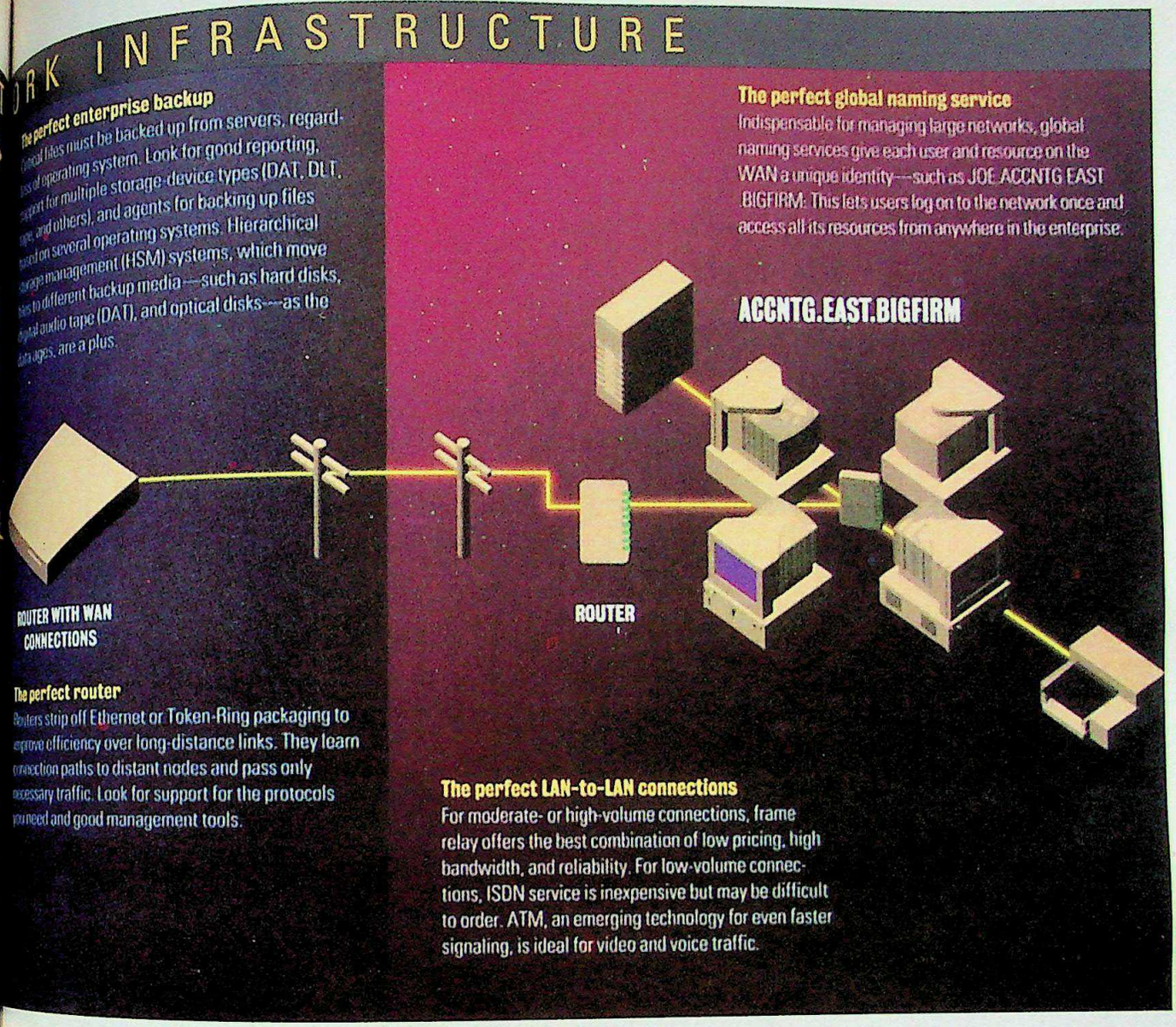
The challenges of designing the best networking infrastructure have, if anything, become more complex. While the Internet and intranets have grabbed the spotlight, the problems of network segmentation, isolation, management, and backup haven't gone away.



On the following pages you'll find our representations of the best way to connect people and resources in your corporation, workgroup, or small office. Our recommendations take in newer trends like Internet access and intranets, but we also include information on mainstream networking topics like remote access, fast networking, switching, routing, network operating systems, and naming services.

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THE PERFECT

Enterprise Network Infrastructure

By Frank J. Derfler, Jr. • The design of the perfect enterprise network infrastructure must evolve and allow for flexibility. We've found that major enterprise components such as WAN transport services, routers, naming services, centralized backup, and network management products become more specialized even as they become more flexible.

We'll start from the outside edges of the enterprise and work our way into the corporate center. Despite the emphasis on flatter organizational structures, most data communications still take place between corporate headquarters and the branch office. Network traffic studies and projections are important for WAN planning, but so is the flexibility to accommodate unforeseen corporate acquisitions, mergers, downsizing, and outsourcing.

Corporate data networks in the U.S. depend on leased telephone lines, which are reliable and economical. But that's changing. Frame-relay services, available from such companies as CompuServe and telephone companies, move packets of data more cost effectively, with much more flexible connection options, and as reliably as leased lines. We recommend mixing frame relay for moderate- to high-volume connections and ISDN for low-volume WAN connections.

Some organizations are considering cutting connection costs by putting WAN traffic on the Internet. We don't recommend it, because today the reliability and security just aren't there.

While routers remain critical to wide-area network operation, they're getting more affordable and evolving into different subspecialties. Routers segregate traffic by destination so that local traffic doesn't crowd long-distance links. Competitive prices and features come from every corner. 3Com sells low-cost routers for remote-office connections to a central site. Cisco and Novell offer router software that runs within a server—saving on hardware costs. Routers play important

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THE NETWORKING TOP TEN

Shown below are the top ten LAN hardware vendors, ranked in order of total revenue based on information from the vendors and The Dell'Oro Group, a market-research firm based in Menlo Park, California.

Rank	Company	Indian subsidiary/partners	Products
1	**Cisco Systems Inc.**	Cisco India, New Delhi; Apcom, Madras; Datacraft ICIM, Bombay; Microland, Bangalore, TUL, Bombay; UB Networks, Wipro, Bangalore	Hubs, network interface cards, routers, switches
2	**Bay Networks Inc.**	Bay Networks India, New Delhi; Datacraft ICIM, Bombay; Microland, Bangalore; Ramco Systems, Madras; Unicorp, New Delhi	Hubs, network interface cards, remote-access servers, routers, switches
3	**3Com Corp.**	3Com India, New Delhi; Building Networks Automation, Bangalore; CMC, Bombay; Exelan, Madras; Godrej Trading, Bombay	Hubs, network interface cards, remote-access servers, routers, switches
4	**IBM Corp., Networking Hardware Division**	TISL, Bangalore	Hubs, network interface cards, routers, switches
5	**U.S. Robotics Corp.**	Microsense Computers, Bombay	Remote-access servers
6	**Cabletron Systems Inc.**	Apcom, Madras; PCS DS, Unicorp, New Delhi; Zenith Computers, Bombay.	Hubs, network interface cards, remote-access servers, routers, switches
7	**Digital Equipment Corp., Network Product Business**	Digital Equipment India, Bangalore; CMS, Godrej Pacific, Bombay; IT&T, New Delhi	Bridges, hubs, network interface cards, routers, switches
8	**Hewlett-Packard Co., Workgroup NetWorks Division**	Hewlett Packard, New Delhi; CMS, Godrej Trading, Bombay; HCL-HP, New Delhi; Zenith Computers, Bombay	Bridges, hubs, network interface cards, routers, switches
9	**Madge Networks Inc.**	Godrej Trading, Bombay	Bridges, hubs, network interface cards, routers
10	**UB Networks Inc.**	UB Networks, Advantec Network System, Wipro, Bangalore	Hubs, network interface cards, routers, switches

roles in Internet and intranet access and in remote LAN access—topics we discuss more in the following pages.

THE BACKBONE

The corporate backbone is a high-speed extension of the WAN links. The primary backbone choice for big sites has been fiber-optic cable with segments isolated by routers. Internal routers now face stiff competition from 100-Mbps Fast Ethernet switches, and those switches are being challenged in turn by switches using asynchronous transfer mode (ATM). The small size of the ATM cells (as individual ATM data packets are called) reduces the maximum delay, or latency, experienced by any cell. So ATM is great for delay-sensitive apps that use sound and video. But ATM standards are not yet complete, and at present ATM components are relatively expensive.

MANAGING THE WAN

Network management alternatives clearly illustrate the combination of specialization and flexibility. Enterprise network management console systems—such as Bay Networks' Optivity series, Hewlett-Packard's OpenView, and SunSoft's Solstice—gather performance and operational data from across the WAN via the Simple Network Management Protocol (SNMP). These systems provide manual and automatic control of WAN and internal backbone operations. The development of the SNMP Remote Monitoring (RMON) database made it practical to put reporting capabilities in wiring hubs and even into special-purpose network-connected devices called probes.

At the same time, management systems—such as McAfee's BrightWorks and Saber LAN Workstation, Seagate Enterprise Management Software's Frye Utilities for Networks, Intel's LANDesk Management Suite, Microsoft's System Management Server, and Novell's ManageWise—monitor the status of each server in detail. They provide various levels of inventory reports on the hardware and software connected to LANs and take care of such tasks as distributing software updates and running virus checks.

Network backup is a separate but equally critical management issue. Enterprise backup systems back up not only file servers, but also Web servers, mail servers, and individual PCs. Administrators have a wide set of options for media including magneto-optical and phase-change devices able to store more than a gigabyte per platter. Multi-CD jukeboxes can serve as the second line of storage in hierarchical storage management (HSM) systems. HSM software from Avail, Cheyenne, IBM, Seagate, and other companies automatically moves less frequently used files off the hard disks and out to more flexible storage, while still keeping the files available for use.

Remember, the ability to back up is interesting, but it's the ability to res data that counts.

THE NAME GAME

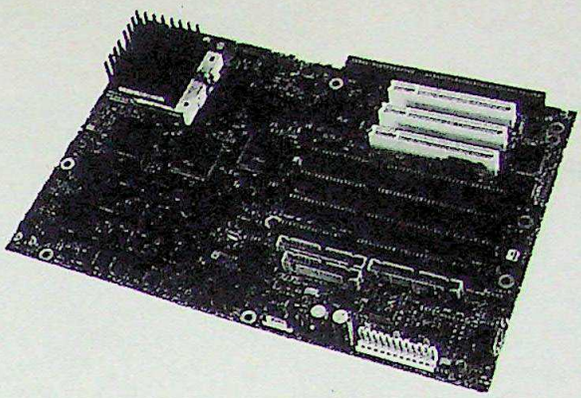
The need for flexibility also shows its network naming and directory schem The old model is for each user to log o each server, but this assumes high user pertise and creates a lot of work for administrator. A global naming servic structure pioneered by Banyan's VIN and now adopted by Novell in NetWa provides a way to name people and n work resources across the enterprise this type of system, users can log on anywhere in the enterprise and immed ately have their standard rights to and resources. Microsoft Windows Server has a similar directory structu based on domains, that can allow use single log on to all resources. Adminis tors can quickly locate and manage sources for their users. To make this p sible, local servers replicate and upda global table of resources throughout enterprise.

A structure like NetWare Direc Services (NDS) allows third-party de opers to write their own links into this vice. Many products, including HSM p grams and many management progra can read NDS entries, so they can tap and describe the network in accurate commonly understood detail.

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THE PERFECT Internet Connection

By Thomas Mace • The Internet sounds like a single entity, but it is really a remarkably diverse collection of communications protocols, applications, and the infrastructure that supports them. Although all Internet installations have some elements in common, your configuration depends on what kinds of applications you wish to support, how you want your users to connect, and the type of performance and security you require.

Our perfect Internet diagram assumes that you want the four most popular Internet applications: Web browsing, e-mail, Usenet newsgroups, and FTP (file transfer protocol) access. Our perfect Internet connection also includes a state-of-the-art Web site and FTP server to present your content to the outside world. It assumes that your organization needs high performance for both inbound and outbound applications and a high level of security for the corporate network. It makes provisions for limiting Internet access privileges for some workgroups and does not assume that all workgroups run TCP/IP, the Internet's native protocol. It also makes provision for remote users to use Internet client applications through remote dial-in connections.

THE PERFECT INTERNET CLIENT

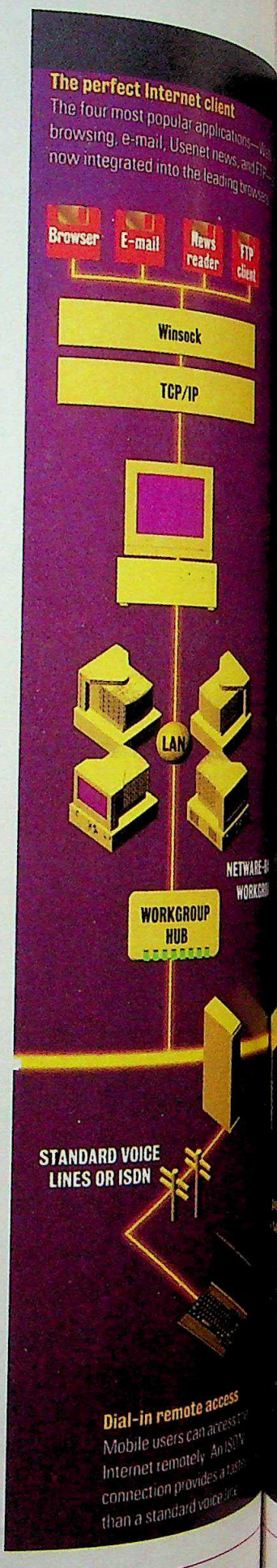
The ideal Internet client PC begins as an ideal PC. It should have a fast processor to make HTML rendering as fast as possible, at least 16MB of RAM to run today's increasingly feature-rich browsers, and plenty of disk space for applications, downloads, and HTML-page caches. You'll also want to have hardware-assisted graphics acceleration, support for 16-bit color, a sound card, and speakers to handle graphics-laden Web pages and all the Web's new multimedia technologies. A number of off-line Internet search tools, such as Frontier Technologies' CyberSearch, also require a CD-ROM drive.

Many state-of-the-art Internet client applications for sending and receiving e-mail, reading Usenet newsgroups, sending and receiving files via FTP, or Web browsing are available for free, sometimes on a trial basis. In some cases, site licenses for corporations may be required. Of these four application types, browsers have become by far the most complex and are quickly incorporating many other applications. The overwhelming market leader today, Netscape Navigator, provides support for standard and proprietary HTML tags, includes in-line graphics viewers, exposes an API for developing plug-ins that extend its functionality, and includes a Java language engine. It also includes a full-fledged Internet mail client and a capable Usenet news reader.

Navigator and most other standard Internet applications work with Windows Sockets (Winsock), a standard API that allows applications to use the TCP/IP protocol. This three-tier system—with the Winsock middleware between the application and the TCP/IP protocol—makes it possible to mix and match client applications and TCP/IP stacks without worrying about protocol-to-application compatibility.

The most straightforward arrangement for connecting clients to the Internet is to assign an IP (Internet Protocol) address to each PC. If your organization does not have access to sufficient IP addresses or does not plan to run the TCP/IP protocol on all clients, IPX-to-IP gateways offer an alternative. Products such as Firefox Communications' Nov*ix for Internet run on a server to provide translation between IPX and IP packets, letting NetWare clients run Internet client applications.

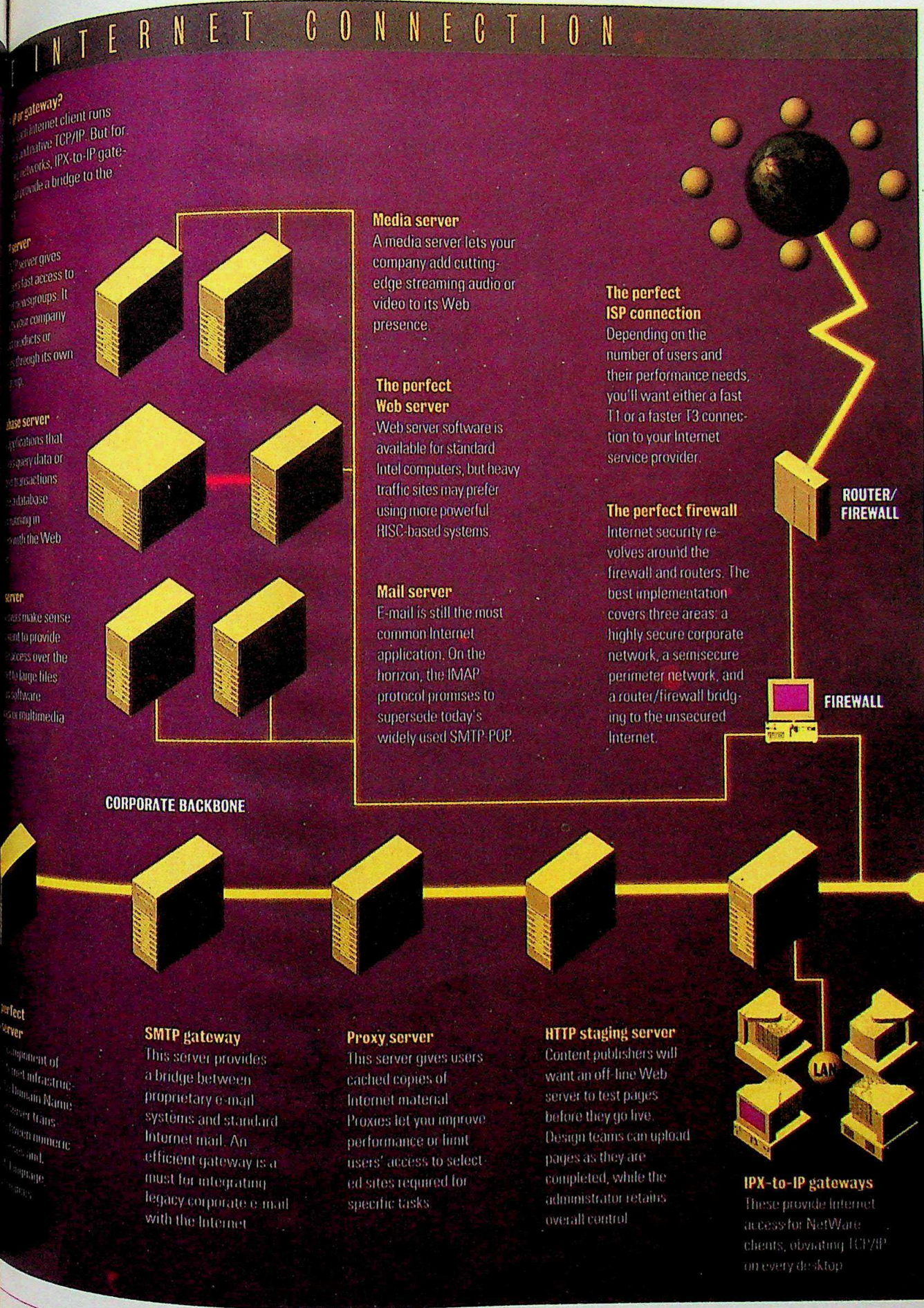
If your organization wants to limit some users' access to a subset of World Wide Web sites, proxy servers provide an answer. These servers mirror a site or group of sites behind your corporate firewall. Users access the mirror image rather than communicate directly with the remote Web servers. Proxy servers can also be used as a way to improve performance of slower external sites dramatically. Proxy servers typically require large amounts of high-performance hard disk storage, especially if the number of cached external pages is high.



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INTERNET CONNECTION



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CORPORATE INFRASTRUCTURE

One of the most important elements in the corporate Internet infrastructure, the Domain Name Service (DNS) server, is also one of the more obscure. This server maintains a list of cross-references between cryptic IP addresses and English-language DNS names. Inside the corporate domain, the DNS server keeps information on all named users and servers so that traffic gets routed to the correct physical machine. The DNS server also keeps basic domain information for the entire Internet, so that when you request a Web page from an external server—*www.pcmag.com,* for example—your request winds up at the right remote server, even if it is thousands of miles away.

Slow DNS response can be crippling to your overall Internet performance. The ideal DNS server will have sufficient memory to cache the entire set of DNS lookup tables in RAM.

Many corporations will also implement Internet mail, which is still one of the Internet's most widely used applications. Of the four mail protocols in use—SMTP (Simple Mail Transfer Protocol), X.400, POP (Post Office Protocol), and IMAP (Internet Message Access Protocol)—SMTP is by far the most common.

Legacy-to-SMTP gateways provide a bridge between Internet mail and proprietary communications systems such as Lotus Notes. An ideal gateway, not often found in practice, seamlessly handles attachments and rich data formats as well as text.

PUBLISHING TO THE WORLD

One of the most attractive features of the Internet is the power it gives corporations to broadcast information. Most of this effort is going into developing content for the World Wide Web, whose servers use the Hypertext Transfer Protocol (HTTP). The type of physical server you choose to deploy depends a lot on the amount of traffic you anticipate. Although server software is available for Intel-based PCs running Windows NT, NetWare, and Unix, many heavy-duty servers are based on RISC processors such as Digital's Alpha, Silicon Graphics' MIPS, and Sun's UltraSparc systems.

On many HTTP servers, pages are stored in a conventional file system with directories and subdirectories. Increasingly, site managers are finding that this is becoming unmanageable for very complex sites that need to be updated frequently. A common solution is to store Web content in a database linked to the HTTP server through Common Gateway Interface (CGI) scripts. In this system, page requests effectively become database queries. Managers can easily maintain content by updating the database. Databases also form the basis of interactive Web applications that provide responses to user queries or execute sales or other transactions.

> *Multimedia is quickly becoming an important component of many Web sites. Many multimedia formats are simple download-and-play technologies where the end user receives an entire file that is executed by a helper application or plug-in.*

Multimedia is quickly becoming an important component of many Web sites. Many multimedia formats are simple download-and-play technologies where the end user receives an entire file that is executed by a helper application or plug-in. Examples include simple AVI video and multimedia formats such as Macromedia's Shockwave for Director. More powerful streaming multimedia technologies, which play a continuous data stream as it arrives at the user's PC, benefit from a dedicated server on the playing end. Examples include Progressive Networks' RealAudio and Xing Technology's StreamWorks, a video-streaming application.

File Transfer Protocol (FTP) and Network News Transfer Protocol (NNTP) servers offer simpler ways to disseminate information to the outside world. FTP servers make sense where you want to make large text or binary files remotely accessible. End users see the server's contents as a standard file structure. NNTP servers make sense if you wish to support a company product or service through Usenet's threaded messaging interface.

SECURITY AND CONNECTIONS

So far, we have discussed Internet applications without considering security issues. But security is of paramount importance since the Internet effectively connects your corporate network to the rest of the world.

Internet security revolves around specialized server software called firewalls that can differentiate between traffic that you want to let in (Web pages and e-mail, for example) and traffic you don't (such as requests to read files on your corporate file servers from workgroup clients).

Though a number of security configurations are possible, a good practice is to group your applications in one of three network areas depending on the security requirements. All three areas interface with the firewall.

The clean-net or most secure area contains the workgroup clients and file servers and any application servers that need to be closely associated with them for performance reasons. The second perimeter network, which has a lesser degree of protection, can be used to deploy applications that generate outbound or two-way traffic. These include your company's Web and media servers, FTP and NNTP (news) servers, and probably your Internet mail server. Finally, the firewall also connects through a router to your Internet service provider. Anything beyond this connection is "dirty-net"—totally unsecured. The bandwidth of the connection to your service provider depends on your overall traffic requirements. Possibilities include T1 (1.5 Mbps), T3 (about 45 Mbps), or several bonded lines of either speed. Small businesses may get by with an ISDN connection if they expect light traffic.

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THE PERFECT Network Operating Environment

By Frank J. Derfler, Jr. • Network operating systems that feature simple file and printer sharing are an endangered species. Evolved networks have layers of services that make up what we call the *network operating environment.* Interoperability and rich built-in or tightly integrated network-based services are the prime features of a network operating environment. The NOSs that compete as network environment platforms include Microsoft Windows NT Server, Novell's NetWare, IBM's OS/2 Warp Server, and various flavors of Unix.

The ability to use several different network transport protocols is the keystone of a network operating environment. Microsoft emulated Novell's IPX/SPX protocol in Windows 95 and Windows NT Server, and virtually every NOS now makes it easy to use TCP/IP, the protocol of the Internet. Because applications running on PCs in these environments can call on various transport protocols, they have access to a variety of print, file, communications, and database services. Multiprotocol environments increase a desktop PC's RAM needs and make management more complex, but that's the price of providing more network services to your users.

Modern network operating systems also make it easy to communicate over a variety of different links. The dial-up networking in Windows 95, for example, allows people to pull data across ISDN or frame-relay links as easily and as invisibly as they can from LAN connections. And you can connect a single- or multiple-transport protocol to a serial port or internal ISDN adapter as easily as you can to a LAN adapter.

THE UNIVERSAL CLIENT

Some desktop PC network operating systems, particularly OS/2 Warp Connect and Windows 95, come with or have available client software for several brands of server software. For example, someone networking under OS/2 Warp Connect or Windows 95 can have drive letters assigned to servers running NetWare, OS/2 Warp Server, and various flavors of Windows. It's also easy to add client software for a Unix server that uses the Network File System (NFS), a de facto Unix standard originally developed by Sun Microsystems. The client operating system's ability to talk to multiple servers makes it practical to use a NetWare server for its excellent file and print service while simultaneously assigning another drive letter to an OS/2, Windows NT Server, or Unix server in order to run applications. File and print services may be a commodity, but competition is hot in application services. An application server runs some specialized program, like an e-mail post office, Web server, fax gateway, or telephony controller, that applications running in networked PCs use.

Network operating environments incorporate highly integrated services and standards for smarter, richer, and better-connected networks.

These application servers typically benefit if they have access to a global naming service so they can quickly identify users and resources. They also perform much better if they can use multiple Intel-based processors or RISC-based processors—such as Digital's Alpha, Motorola's Power PC, and Sun Microsystems' UltraSparc—for heavy processing loads. Windows NT Server leads the NOS pack when it comes to hardware flexibility and scalability. Client/server systems blend application server and file server functions.

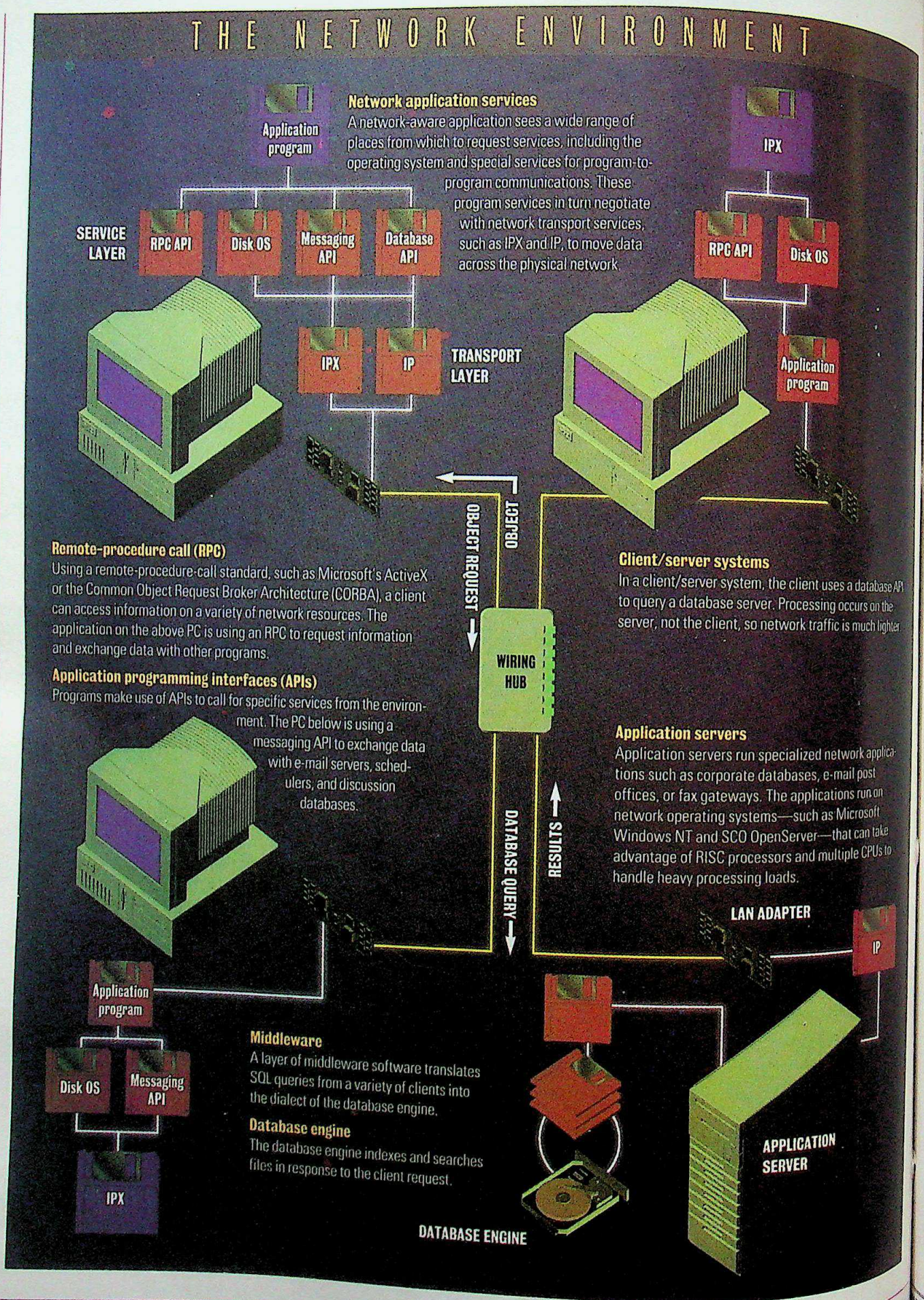
Client programs use the IP or IPX transport to carry requests to a database server. This server can be a PC equipped with a heavy-duty storage system or even a mainframe running a time-proven database. The mainframe might use another layer of software, called middleware, to translate between the client queries and the database. In either case, a program in the database server does the indexing and sorting tasks for the applications, thereby reducing the traffic load on the network and the workload at each client.

Network operating environments offer more services to applications as application programming interfaces (APIs)—formats that programmers use to call for specific services from the environment. Examples of these include a messaging API, such as Microsoft's Messaging API (MAPI), that carries shorthand forms of requests and replies between application servers and clients. A telephony API such as Novell's Telephony Server API (TSAPI) lets applications control desktop telephones and PBX functions. And remote procedure calls (RPCs), such as Microsoft's ActiveX specification, give client-side programs sophisticated ways to move objects and information among networked programs.

The evolution will continue as Microsoft and IBM introduce more interprogram structures into the network environment. Middleware layers such as Microsoft's Open Database Connectivity (ODBC) provide a standard way to link programs with databases. ODBC is seeing new uses in linking corporate intranet sites to corporate databases. Microsoft and IBM have suites of network management, software distribution, e-mail, mainframe access, and other applications aimed at providing the same environmental invisibility in many areas. Setup, graphical, and computational information regularly flows between programs in these environments.

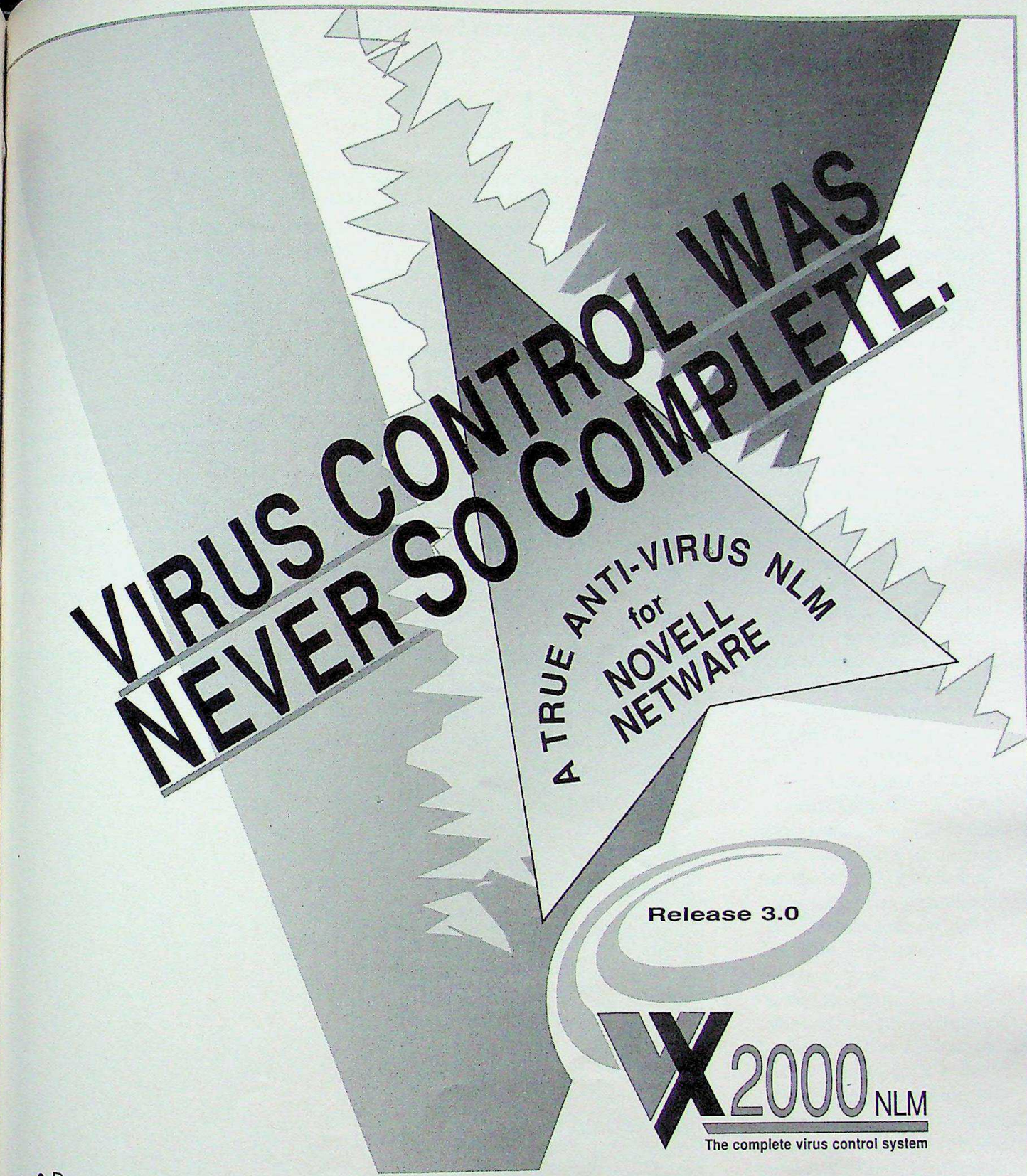
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- Real-time scanning
- 100% detection of polymorphic viruses
- Detects unknown viruses
- Directory level security
- Logs all activity
- Tracks network and user IDs for source of infection
- Auto disconnect of infected nodes to prevent the virus from spreading
- 25th line broadcast to selective users
- Password security
- Does not degrade file server performance
- User defined scheduled scanning for all/specific volumes
- Console/node-based configurability
- Regular updates for registered users

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THE PERFECT Departmental LAN

By Frank J. Derfler, Jr. • The client PC is where all networking converges. It is a window into a network of shared resources. The perfect departmental LAN makes this window transparent, so that distant resources look as if they're inside the client PC.

We describe the global view of networking software in "The Perfect Network Operating Environment" in this section. At the desktop PC, the client software consists primarily of redirector and network-transport software. The redirector recognizes an application's request for LAN resources. Essentially, the redirector knows that requests made to the E: drive or LPT2 are intended for a specific network server or printer. The transport programs package the data according to network transport specifications (such as IP or NetWare's IPX) and send the data packets out to the LAN adapter.

LAN adapters translate the low-power parallel data inside the computer into a higher-power serial stream for external connectivity. The LAN adapters must be compatible with the network cabling, the PC's internal data bus, and the network operating system. Fortunately, standards such as Ethernet and Token-Ring for signaling and access across the cable, ODI (emulated by Microsoft's NDIS) for operating system interfaces, and PCI for the PC's bus let you choose adapters from many manufacturers. IBM, Motorola, 3Com, and Xircom offer PC Cards (formerly PCMCIA cards) that combine a LAN adapter with a modem.

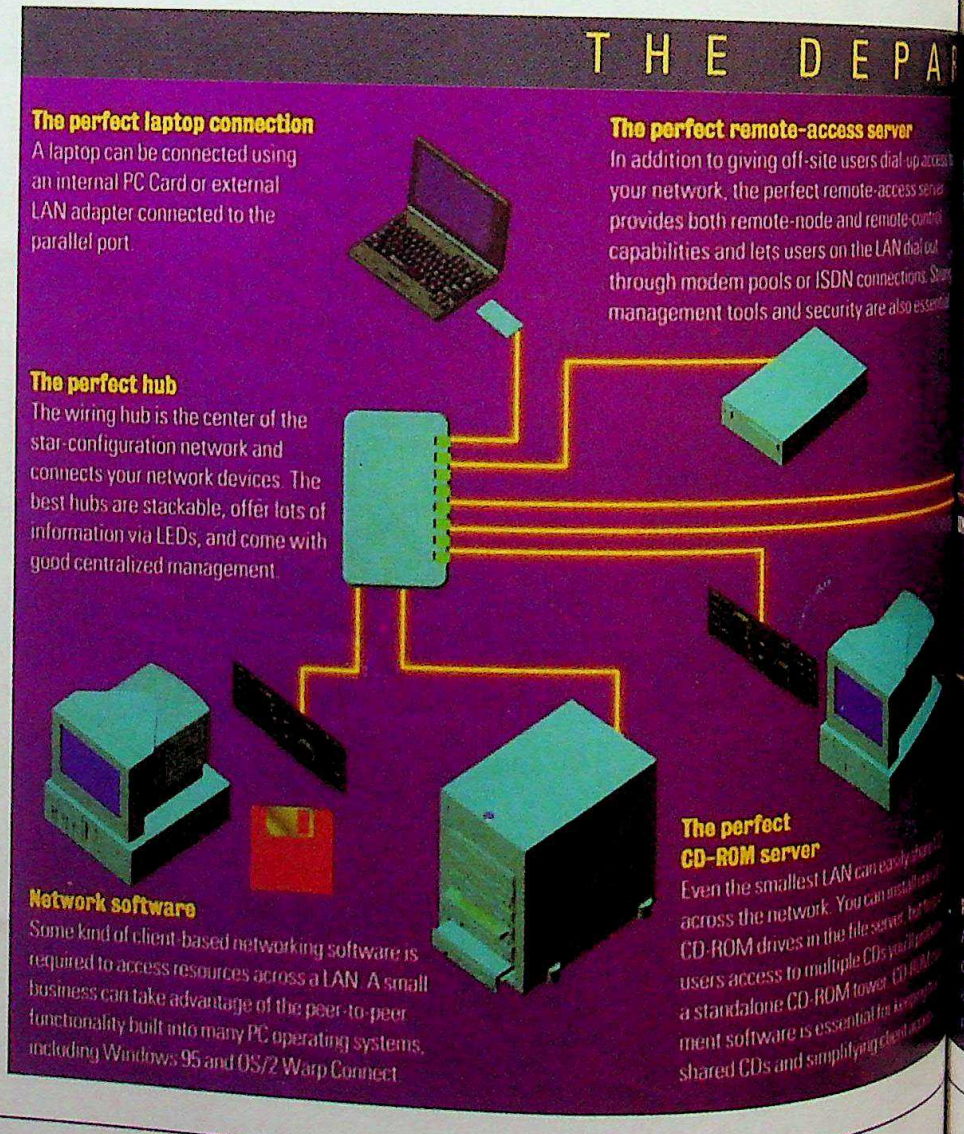
The perfect LAN blends two network cabling technologies: unshielded twisted-pair (UTP) and fiber-optic cable. Installing UTP cable meeting the EIA Category 5 specification, along with such other Category 5 equipment as connectors and patch panels, gives you a cable infrastructure that should last for at least a decade. A Category 5 UTP system can carry the fastest practical signaling in use today—ATM at 155 Mbps—over distances of about 100 feet. For longer distances or in noisy electrical environments, you can augment the UTP with fiber-optic cable. Fiber-optic components are still expensive, however, so you'll want to use UTP to the desktop in practically every environment.

WIRED WORKGROUPS

The perfect workgroup uses network adapters that can operate using either standard 10-Mbps Ethernet (10Base-T) or Mbps Fast Ethernet (100Base-T) as cations drive the need for faster si These adapters—called 10/100 ada serve as affordable insurance against nological surprise. Also, if you're r at 100 Mbps, your desktop PCs and s should use PCI-bus adapters.

A network hub is at the geogra center of the workgroup LAN. A provides electrical isolation for the runs to each node so that a short c cable doesn't take down the entire L You need a hub port for each nod cluding PCs, printers, access server other specialized devices.

Stackable hubs, the hottest pro in this category, are separate mo



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...nest together with a high-speed interconnection. Electrically, the interconnected stack looks like one entity on the LAN, so the stack doesn't violate rules about the number of repeating devices that can pass signals on a network segment. Financially, stackables present an easy way to expand capacity and features in affordable steps. Network segmentation is an important consideration in designing the perfect LAN. You can reduce contention for access to the cable and overall LAN traffic by breaking the LAN into logical pieces connected by a smart device. If you're using a NetWare file server, it's easy and practical to segment the LAN by putting more than one LAN adapter in the file server. NetWare has an internal router that can move traffic between segments while reducing the competition for access. In case you're not using NetWare, you can install a separate internal router for LAN segments that have a lot of internal traffic.

Switching is the latest technique for reducing LAN congestion. A switch routes packets of data between nodes on the LAN. Each switched segment has uncontended cable access and sees only traffic destined for its segment. Switches from Asanté, Bay Networks, Cisco, Digital, 3Com, and others are easy to add to a network: Installation consists of plugging in a few cables. You can replace a hub with a switch, add a switch to a stackable hub, or use a switch as a backbone to connect groups of hubs. As our diagram shows, a switch is an excellent traffic director between workgroup LAN hubs and busy file servers. For the best data path, you'll want a switch with a dedicated 100-Mbps server connection.

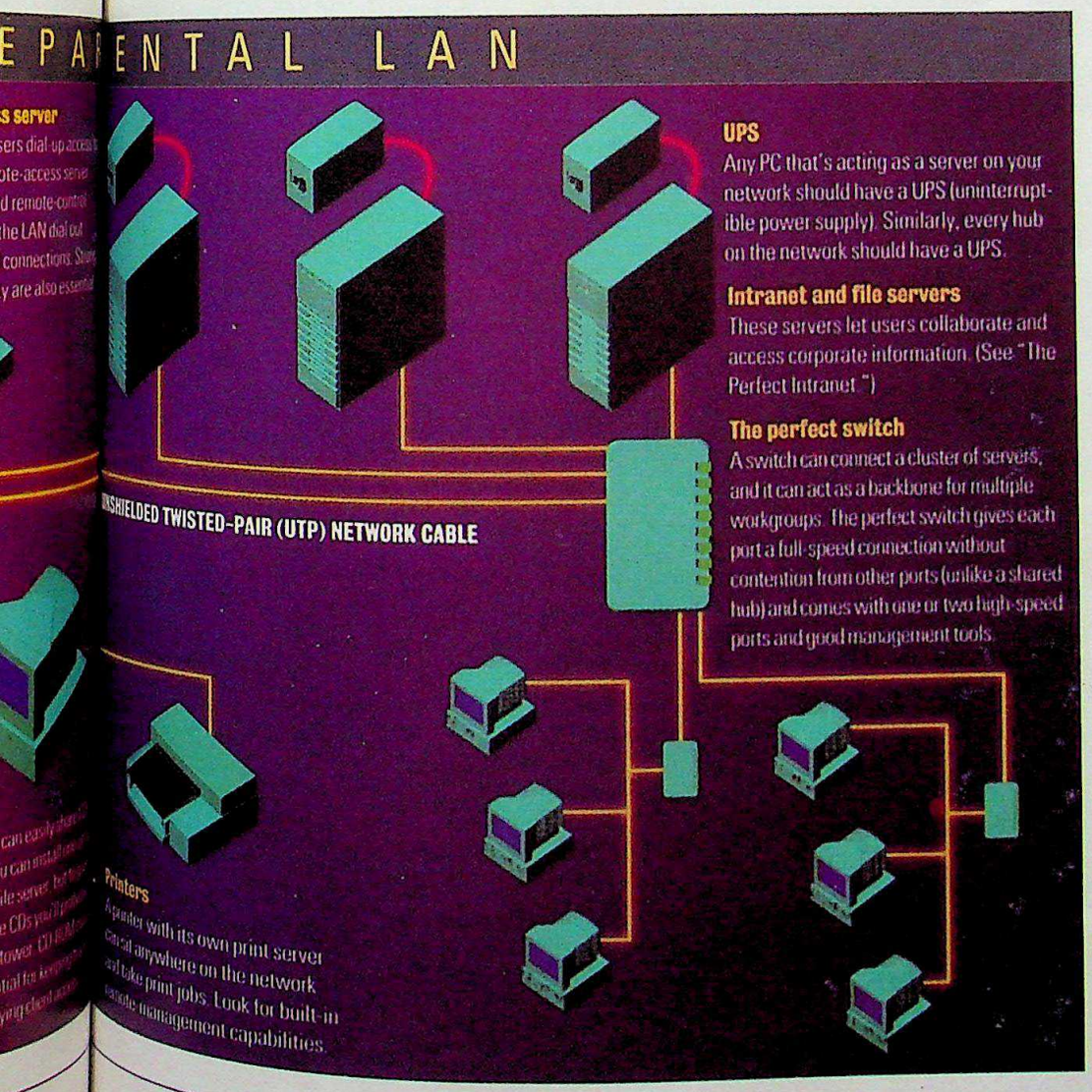
OTHER NETWORK SERVICES

Networked printers and remote-access servers are important elements of the departmental LAN. Each networked printer takes print jobs from individual PCs or from print servers, often servicing both IP and IPX requests. Network printers have to connect only to a LAN cable and AC power, so you can place them in convenient spots throughout the department.

Remote-access service breaks down into remote node and remote control. Remote-control software—such as that from Artisoft, Avalan, Microcom, Symantec, Traveling Software, and others—lets you remotely operate a PC and is useful because it keeps important data on the LAN. Remote-node connections allow the same type of operation on the road as in the office but with some practical limitations on what you can pull across the dial-up link.

Remote-node servers are routers. Products from companies such as Ascend, Cisco, Microcom, Shiva, and 3Com can connect through analog modems or ISDN devices. In addition to dial-in connections, they also provide shared dial-out service.

A departmental intranet server may provide an ideal medium for sharing information on the LAN, especially if you have multiple operating systems on the network. See "The Perfect Intranet" in this section.



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THE PERFECT Intranet

By Frank J. Derfler, Jr. • Intranets, which use Internet technology inside the corporate network, sound deceptively simple. But their capabilities will surprise you. Intranet Web servers can scale from individual departments to worldwide enterprises. You'll start out using them to publish information such as telephone directories, but you'll find that they can be the basis of group discussion systems and the salvation of older mainframe-based applications.

The ubiquitous, inexpensive Web browser makes intranets practical. You can find browsers for practically every hardware and operating system platform. Instead of worrying about installing client packages for proprietary publishing, scheduling, and discussion systems, network managers need only consider how to connect users to their intranet Web servers.

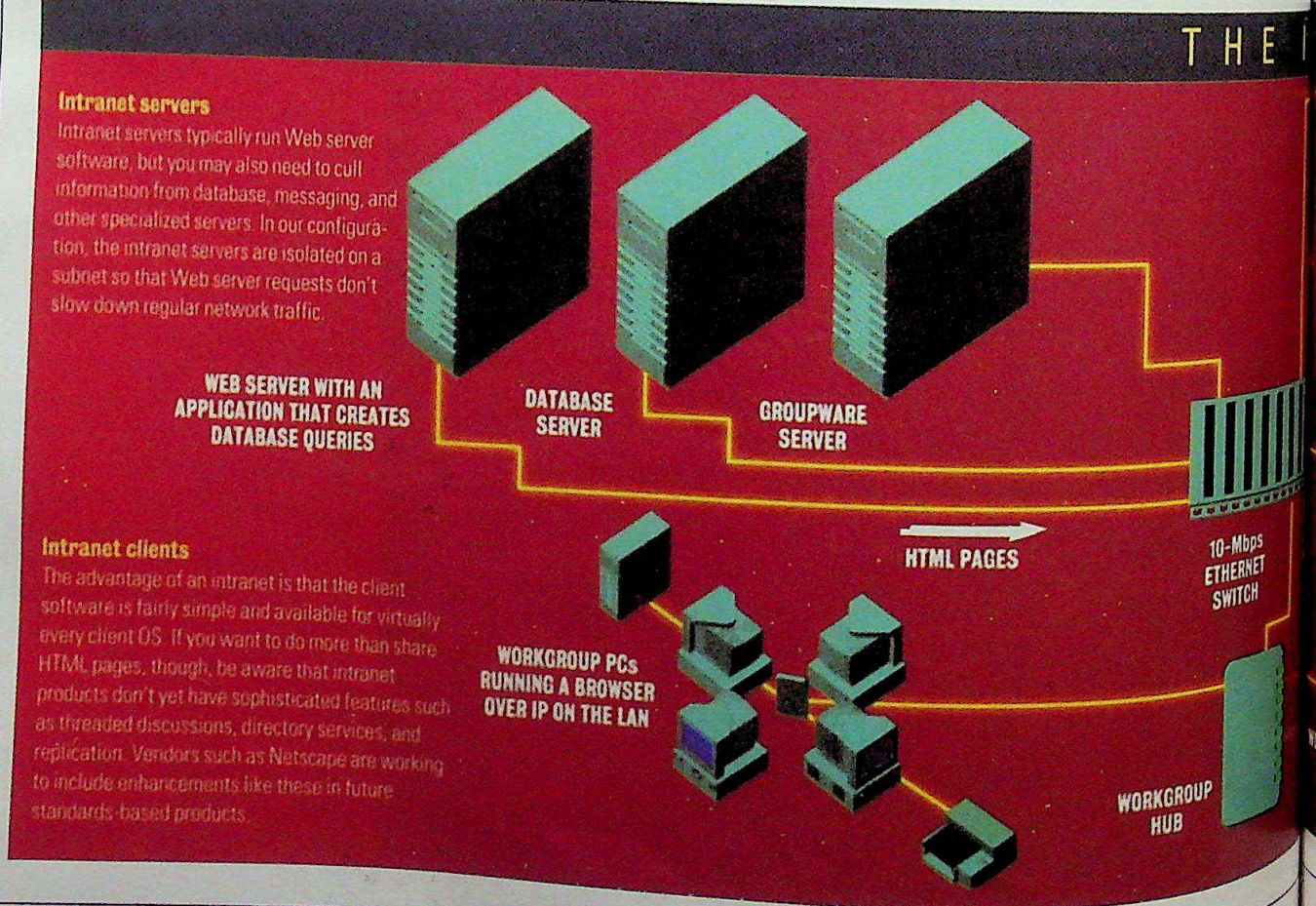
Generally, Web servers are affordable and not difficult to run. An intranet server can be as simple as a Pentium-class computer equipped with 32MB of RAM, a CD-ROM, a LAN adapter, and Windows NT Server—for a total cost of less than $3,800. This kind of system can satisfy thousands of page requests a day, but it might suffer slowdowns during peak request times. Adding a faster disk access subsystem would improve its capacity.

The hidden cost of Internet and intranet technology may jump out at you if you have to add TCP/IP protocols to your LAN and corporate PCs. Adopting TCP/IP on your corporate network creates significant equipment, training, and management burdens. PCs need more RAM; you might have to reconfigure and update routers; and the specter of outsider intrusion raises its head. As an alternative to NetWare networks, you can use IPX-to-IP gateways, such as those from Firefox Communications, Performance Technology, and Quarterdeck, to avoid having to add IP to every desktop PC.

REMOTE POSSIBILITIES

A solid remote-access strategy is crucial to the success of an intranet. The nature of the browser and IP relationship dictates remote-node access service for all callers. We suggest remote-access routers that connect over both modems and ISDN adapters, protected with passwords and security servers.

Most users will access intranet servers across the corporate WAN. If your intranet system is successful, you may incur a secondary cost in reconfiguring your LAN to accommodate a busy Web server. As our diagram shows, you can create a subnet behind a switch with the Web server, information database server, and remote-access server each having a dedicated segment on the switch. This keeps intranet traffic off the cables con-



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your network's bread-and-butter data.

The person in charge of the intranet sys- needs practically the same skills as the administrator of a small LAN, plus some mentary graphic-arts skills and the abil- to handle both TCP/IP and HTML. You find useful HTML editing tools on the eb, and even desktop application suites ch as Microsoft Office and have HTML ting features. As an intranet grows, skills e database administration, advanced aphic arts, and telecommunications man- ement quickly come into play.

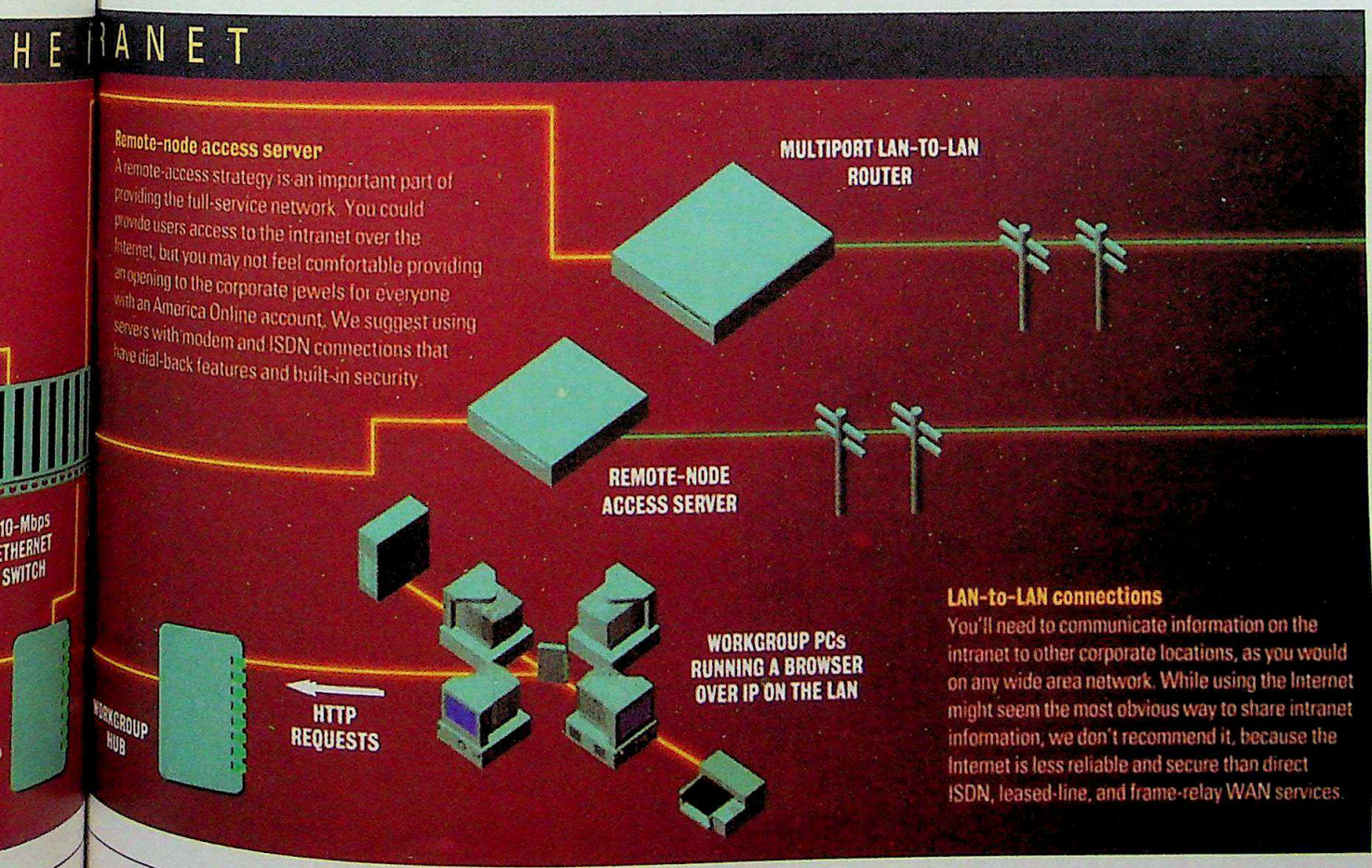
While it's easy to start an intranet, its mplexity can grow quickly. Web server ftware recognizes HTTP requests from owsers and does something in response. The typical response is to transmit an TML-encoded page back to the client. t the server can also pass requests on to her layers of software or even to other rvers on the LAN for action. That hand- ff between the Web server and other nctions is critical, because it opens the door to such capabilities as sophisticated e-mail and database services that make an intranet competitive with established groupware products.

A standard called the Common Gateway Interface (CGI) allows browser requests to kick off a user-written program that can generate a query to a database. The CGI program then formats the response to the query into HTML and sends it back to the Web server, which sends it back to the browser. CGI programming isn't for novices, but Oracle and Sybase each provide information at their Web sites on how it's done. Microsoft offers a layer of Windows NT Server software—called the Internet Database Connector—that translates between HTTP and products that conform to the Open Database Control standard.

Intranets are challenging, and working with, established proprietary document database, workgroup discussion, e-mail, and scheduling applications such as Novell's GroupWise and Lotus Notes. Digital Equipment Corp. has a big stake in the market with its impressive Workgroup Web family of intranet group discussion products. Similarly, Folio Corp.'s Infobase Web Server provides a slick way to get at documents that are stored in Folio's proprietary database structure.

Last year, Netscape acquired Collabra Software and its premier threaded-discussion system. With the promised capability to integrate hypertext links within a threaded discussion system, the Netscape Web server and browser are an obvious choice for an intranet solution. But Lotus is keeping up: The Lotus InterNotes server links HTTP servers to Notes document databases. Notes also offers replication, a capability that is in its infancy on the Web.

We can expect products that combine browsers with a wide variety of common applications and utilities from Attachmate, Digital, Lotus, Microsoft, Netscape, Novell, Quarterdeck, and others.



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THE PERFECT

Small Office Connections

By Frank J. Derfler, Jr. • Small offices typically have small budgets for such overhead items as networking and communications. Our goal for the perfectly connected small office is to make it work like a large corporate office while holding down costs.

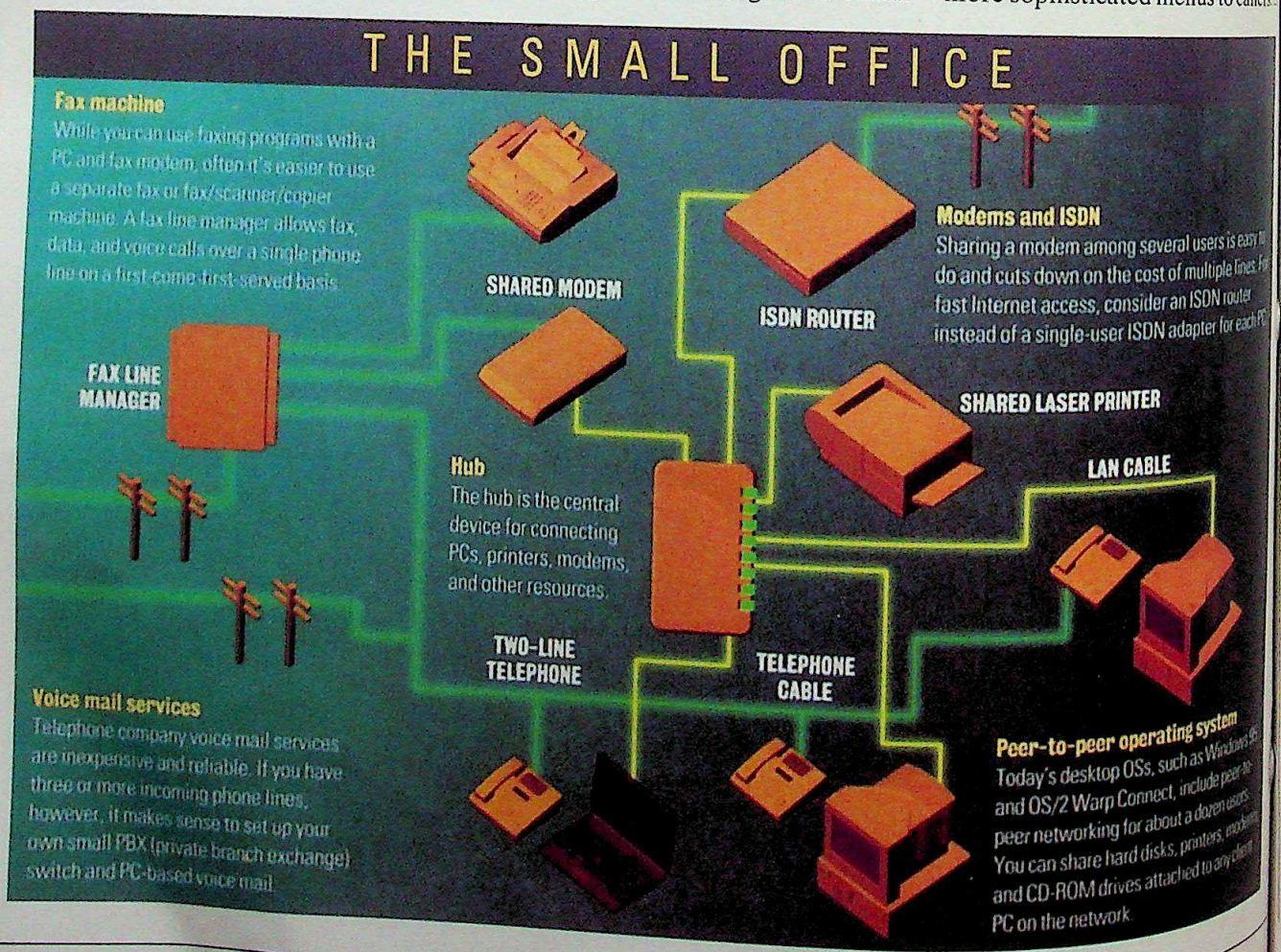
Our plan starts with a LAN. Even for those who have only two PCs, a LAN connection provides the fastest and most reliable way to share hard drives, CD-ROM drives, modems, printers, and other resources. Microsoft's Windows family of products are probably the most convenient network operating systems. Peer-to-peer networking—sharing resources among PCs on the network instead of using dedicated server systems—is built into Windows for Workgroups, Windows 95, and Windows NT Workstation. OS/2 Warp Connect provides similar Artisoft's LANtastic family adds some more-advanced features to a peer-to-peer network. Companies such as Asanté Technologies, D-Link, and Linksys sell tiny hubs that can stick to the back of a desk, so the cabling is out of the way.

For fast Internet access, even on a three- or four-node LAN, we suggest using an ISDN router instead of individual ISDN adapters. A router can be centrally managed, and splitting the cost of a single line for several users makes sense. You will probably need to get a static IP address from your Internet service provider, but the benefits outweigh the hassle. We also suggest sharing a modem for outbound analog calls. Shared modems are easy to set up, and they save money.

While you can integrate fax capabilities inside a PC, it's hard to match the convenience of a separate fax machine or a combination fax/scanner/printer. Similarly, we suggest subscribing to voice mail from the local telephone compan... stead of setting up an answering ma... These services typically cost only a... $20 a month, and your callers never g... busy signal.

A simple device called a fax line m... ager allows a fax machine, a modem, a... a telephone to share a single telepho... line on a first-come-first-served b... You can set it up to recognize differ... types of incoming calls and route t... to the appropriate device. We sug... using the fax/modem line as an outg... voice line when it isn't otherwise in...

Two incoming lines can satisfy an... fice of three or four workers. When y... add a third or fourth incoming l... though, you should consider a small P... (private branch exchange) switch an... PC-based voice mail and interactive v... response (IVR) system. A PC-based I... system can provide voice mail as we... more sophisticated menus to callers...



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150 COMPANIES

Another year of nonstop change in the PC industry finds the leading hardware and software vendors still holding sway—most of them, that is. Here's a look at the numbers that make them leaders.

THE PC MAGAZINE TOP

EVERY SERIOUS COMPETITION DEserves a serious scorecard. Because no other industry is as knock-down competitive as the PC industry, once again *PC Magazine* provides financial profiles of the most successful companies in the business. Inside you'll find lists of PC hardware and software companies ranked by 1995 revenues in the categories of PCs, PC servers, software, LAN hardware, printers, monitors, hard disks, and graphics/video boards.

Speaking of 1995, if not for the mind-boggling explosion of Internet developments and the endless hubbub surrounding the introduction of Windows 95, the year was pretty sedate for most of the PC industry's leading hardware and software vendors. In just about every category, last year's leaders are this year's leaders.

Below the top positions, however, the turmoil carries on. Because almost every category is experiencing a continuing consolidation of power in the hands of the industry leaders—often through acquisitions of less-fortunate players—we decided to trim our list to 150 companies from last year's 200 in order to focus on the true champions.

In terms of acquisitions, beyond the one mega-merger that came off—IBM's acquisition of Lotus Development Corp. —the year was justifiably noted for two mergers that did not happen: the Microsoft purchase of Intuit, quashed by Justice Department opposition, and the on-again, off-again deal that would have made Apple a part of Sun Microsystems.

Not that there weren't any changes over the year. Netscape Communications came from nowhere to crack the top ranks of PC software vendors and seems headed up the ladder several rungs per month.

The PCs category continues to be an arena of change as well, with ZEOS making its last appearance as it submerges forever into the organization of its new owner Micron. Zenith Data Systems similarly shifts corporate hats to that of its new owner Packard Bell.

Joining financially troubled Apple to illustrate that sometimes even success doesn't succeed, CompuAdd went out of business in late 1995 even though it ranked in the top 25 of PC sellers. And AT&T's struggling Global Information Solutions branch got a second—or is that third?—lease on life when its parent sent it back out in the world wearing its former NCR label.

In another change, the continuing growth of the client/server computing model persuaded us to add a new category, PC servers. To make room for it, we dropped several of last year's smaller categories. In a more major departure from last year's approach, we worked closely with some of the industry's leading researchers and analysts to bring you data honed by their many years of combined experience. Specifically, this effort owes its success to Soft•letter, the Dell'Oro Group, Dataquest, Stanford Resources, International Data Corp., John Peddie Associates, and Computer Intelligence, all of which partnered with the *PC Magazine* research staff for this compilation.—*Jake Kirchner*

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THE PC MAGAZINE 150

Rank	Company (or division)	Indian subsidiary/partners	U.S. PC revenues 1995 (millions)	Units shipped in U.S., 1995 (thousands)	Parent company	Ownership of parent company	Parent company's revenues 1995 (millions)
PCs							
1	Apple Computer Inc.	Apple Computer, Bangalore; Odin Computers, New Delhi; Tangerine, Bombay; Wipro, Bangalore	$7,130	2,439	Apple Computer Inc.	Public	$11,278
2	Compaq computer Corp.	Compaq Computer Asia, Bangalore; BPL, CG Infomatics, Fujitsu-ICIM, Bombay; Microland, Bangalore; Mini Computer, Tangerine, Bombay; Unicorp, New Delhi	$6,756	2,832	Compaq Computer Corp.	Public	$14,755
3	IBM Corp.	TISL, Bangalore	$6,395	2,466	IBM Corp.	Public	$71,940
4	Packard bell Electronics Inc.	Nil	$5,535	2,548	Packard Bell Electronics Inc.	Private	$4,200
5	Gateway 2000 Inc.	DCM Data Systems, New Delhi	$3,523	1,162	Gateway 2000 Inc.	Public	$3,675
6	Dell Computer Corp.	ESPL, Chandigarh; PCL, New Delhi; Rolta India, Bombay	$2,893	1,242	Dell Computer Corp.	Public	$5,296
7	Hewlett-Packard Co.	Hewlett-Packard India, New Delhi; CMS, Bombay; ECIL, Hyderabad; Godrej Trading, Bombay; HCL-HP, New Delhi, Zenith Computers, Bombay	$2,315	744	Hewlett-Packard Co.	Public	$33,512
8	Toshiba America Information Systems Inc., Computer Division	Teknotron Information Systems, New Delhi	$2,195	626	Toshiba Corp.	Public	$52,200*
9	NEC Technologies Inc.	Byte Systems, Calcutta	$2,144	687	NEC Corp.	Public	$36,717
10	AST Computer	AST, Advance Micronic Devices, Bangalore; CMS, Bombay; DDE-ORG, Baroda; TUL, Tangerine, Bombay	$1,871	687	AST Research Inc.	Public	$2,545
11	Digital Equipment Corp., Personal Computer Business Unit	Digital Equipment India, Bangalore; CMS, Godrej Pacific, Bombay; IT&T, New Delhi	$1,718	596	Digital Equipment Corp.	Public	$14,442
12	Acer America Corp.	Wipro, Bangalore; CMS, Bombay	$1,670	623	Acer Inc.	Public	$5,700
13	AT&T Global Information Solutions (now NCR Computer Systems Group)	AT&T, New Delhi; CMS, Minicomp, Bombay	$1,581	496	AT&T Corp. (now NCR Corp.)	Public	$79,609
14	Epson America Inc.	Wipro, Bangalore; Digital World, Redington, Bombay	$653	241	Seiko Epson Corp.	Private	$4,577*
15	Zenith Data Systems Corp.(acquired by Packard Bell Electronics Inc.)	Nil	$358	151	Groupe Bull	Public	$4,200
16	Leading Edge Products Inc. (acquired by Manuhold Investment AG)	Nil	$295	101	Daewoo Corp.	Private	$1,000
17	Texas Instruments Inc., Personal Productivity Products	Texas Instruments India, Bangalore; MPC Technologies, Zenith Technologies, Bombay	$230	91	Texas Instruments Inc.	Public	$13,129
18	Power Computing Corp.	Nil	$200	63	Power Computing Corp.	Private	$225*
19	Micron Electronics Inc.	Nil	$190	112	Micron Technology Inc.	Public	$3,654
20	Siemens Nixdorf	Siemens Nixford, Bombay; Pragati Computers, Madras	$179	50	Siemens AG	Public	$60,226*
21	ZEOS International Ltd. (merged into Micron Electronics Inc.)	Nil	$177	77	Micron Technology Inc.	Public	$3,654
22	Olivetti North America	Modiolivetti, New Delhi	$133	23	Ing. C. Olivetti & C., S.p.A.	Public	$6,048
23	Unisys Corp.	Tata Unisys, Bombay	$105	60	Unisys Corp.	Public	$6,202
24	Advanced Logic Research Inc.	Ark Technologies, Bangalore; Peerless Infotech, Calcutta	$101	31	Advanced Logic Research Inc.	Public	$204
25	DTK Computer Inc.	Nil	$95	35	DTK Computer Inc.	Private	$350
PC SERVERS							
1	Compaq Computer Corp.	Compaq Computer Asia, Bangalore; BPL, Fujitsu-ICIM, Bombay; Microland, Bangalore; Minicomp, Tangerine, Bombay; Unicorp, New Delhi	$3,146	295	Compaq Computer Corp.	Public	$14,755
2	IBM Corp.	TISL, Bangalore	$2,140	120	IBM Corp.	Public	$71,940
3	Dell Computer Corp.	ESPL, Chandigarh; PCL, New Delhi; Rolta, Bombay	$801	45	Dell Computer Corp.	Public	$5,296
4	Hewlett-Packard Co.	Hewlett-Packard India, New Delhi; CMS, Bombay; ECIL, Hyderabad; Godrej Trading, Bombay; HCL-HP, New Delhi; Zenith Computers, Bombay	$597	42	Hewlett-Packard Co.	Public	$33,512
5	Digital Equipment Corp., Personal Computer Business Unit	Digital Equipment India, Bangalore; Godrej Pacific, Bombay; IT&T, New Delhi	$532	51	Digital Equipment Corp.	Public	$14,442
6	AT&T Global Information Solutions (now NCR Computer Systems Group)	AT&T, New Delhi; CMS, Minicomp, Bombay	$352	1	AT&T Corp. (now NCR Corp.)	Public	$79,609
7	Apple Computer Inc.	Apple Computer, Bangalore; Odin Computers, New Delhi; Wipro, Bangalore; Tangerine, Bombay	$181	23	Apple Computer Inc.	Public	$11,278

* Estimated

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THE PC MAGAZINE 150

Rank	Company (or division)	Indian subsidiary/partners	U.S. PC revenues 1995 (millions)	Units shipped in U.S., 1995 (thousands)	Parent company	Ownership of parent company	Parent company's revenues 1995 (million)
9	AST Computer	AST Computer, Advance Micronic Devices, Bangalore; CMS, Bombay; DDE-ORG, Baroda	$166	12	AST Research Inc.	Public	$2,348
10	Unisys Corp.	TUL, Bombay	$115	7	Unisys Corp.	Public	$6,202
10	Zenith Data Systems Corp.(acquired by Packard Bell Electronics Inc.)	Nil	$86	7	Groupe Bull	Public	$4,200

Rank	Company (or division)	Indian subsidiary/partners	Worldwide PC Software revenues 1995 (millions)	Parent company	Ownership of parent company	Parent company's revenues 1995 (million)
PC SOFTWARE						
1	Microsoft Corp.	Datapro, Pune; Godrej Trading, Bombay; Microland, Sonata, Bangalore; TUL, Bombay	$7,420	Microsoft Corp.	Public	$7,420
2	Novell Inc.	Novell Software Development India, Bangalore; Onward Novell, Bombay	$1,902	Novell Inc.	Public	$1,902
3	IBM Corp.	BPB Publications, Enterprise Consultant Services, New Delhi; Kal's Information, Bombay; MB SW, Calcutta; RK Computers, Smile SW, Bombay; Sonata, TISL, Bangalore	$1,500*	IBM Corp.	Public	$71,940
4	Adobe Systems Inc.	Datapro, Pune; Wipro, Bangalore	$762	Adobe Systems Inc.	Public	762
5	Autodesk Inc.	Hope, New Delhi; Neil Automation Technologies, Pune	$534	Autodesk Inc.	Public	$534
6	Intuit Inc.	Nil	$503	Intuit Inc.	Public	$503
7	Symantec Corp.	Infosys, Technology, Sonata, Bangalore; Svam Software, New Delhi	$438	Symantec Corp.	Public	$438
8	Attachmate Corp.	Decibell Computers, Bombay	$415	Attachmate Corp.	Private	$415
9	Oracle Corp.	Oracle India, New Delhi; Hexaware, TCS, Bombay	$322	Oracle Corp.	Public	$3,479
10	SoftKey International Inc.	ACI Infotech, Bangalore	$255	SoftKey International Inc.	Public	$255
11	Sybase Inc.	NIIT, New Delhi	$228	Sybase Inc.	Public	$957
12	Quark Inc.	Binary, Summit Data Products, New Delhi	$225*	Quark Inc.	Private	$225*
13	GT Interactive Software Corp.	Nil	$204	GT Interactive Software Corp.	Public	$204
14	Santa Cruz Operation Inc.	SCO, Hexaware, Hinditron, Bombay; PCL, New Delhi	$199	Santa Cruz Operation Inc.	Public	$199
15	Corel Corp.	Svam, New Delhi; Wipro, Bangalore; Datapro, Pune	$196	Corel Corp.	Public	$196
16	Broderbund Software Inc.	Nil	$190	Broderbund Software Inc.	Public	$190
17	Claris Corp.	Infomart India, Bangalore	$184	Apple Computer Co.	Public	$11,378
18	Digital Equipment Corp.	Digital Equipment India, SSA, Bangalore	$175*	Digital Equipment Corp.	Public	$14,440
19	Cheyenne Software Inc.	Onward Technologies, Bombay	$158	Cheyenne Software Inc.	Public	$158
20	Davidson & Associates Inc.(acquired by CUC International Inc.)	Nil	$147	Davidson & Associates Inc.	Public	$147
21	Sierra On-Line Inc.(acquired by CUC International Inc.)	Nil	$145	Sierra On-Line Inc.	Public	$145
22	FTP Software Inc.	Microland, Bangalore; Priya International, Bombay; T-Net, New Delhi	$136	FTP Software Inc.	Public	$136
23	NetManage Inc.	Intercon Systems, New Delhi; Infosys Technology, Bangalore; Decibell, Bombay	$125	NetManage Inc.	Public	$125
24	Computer Associates Inc.	Infosys Technology, Bangalore; Mastek, Bombay.	$125	Computer Associates Inc.	Public	$3,196
25	Walker Richer & Quinn Inc.	Nil	$112	Walker Richer & Quinn Inc.	Private	$112
26	Wall Data Inc.	Nil	$111	Wall Data Inc.	Public	$111

*Estimated

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THE PC MAGAZINE 150

Rank	Company (or division)	Indian subsidiary/partners	Worldwide PC Software revenues 1995 (millions)	Parent company	Ownership of parent company	Parent company's revenues 1995 (millions)
27	Informix Software Inc.	Hinditron, Informix India, Silverline Industries, Bombay	$106	Infomix Software Inc.	Public	$718
28	Interplay Productions Inc.	Nil	$100	Interplay Productions Inc.	Private	$100
29	Macromedia Inc.	Macro Multimedia, New Delhi; Wipro, Bangalore	$97	Macromedia Inc.	Public	$97
30	Bentley Systems Inc.	Rolta India, Bombay	$95	Bentley Systems Inc.	Private	$95
31	Quarterdeck Corp.	Unison Computers, Bombay	$93	Quarterdeck Corp.	Public	$93
32	McAfee Associates	Nil	$90	McAfee Associates Inc.	Public	$90
33	Netscape Communications Corp.	Microland, Wipro, Bangalore	$81	Netscape Communications Corp.	Public	$81
34	Micrografx Inc.	Softek, New Delhi	$64	Micrografx Inc.	Public	$64
35	SPSS Inc.	Wipro, Bangalore	$63	SPSS Inc.	Public	$63
36	Spectrum HoloByte Inc.	Nil	$57	Spectrum HoloByte Inc.	Public	$57
37	Platinum Software Corp.	ALIT, Bangalore	$56	Platinum Software Corp.	Public	$56
38	Insignia Solutions Inc.	Nil	$55	Insignia Solutions Inc.	Public	$55
39	Phoenix Technologies Ltd.	Nil	$53	Phoenix technologies Ltd.	Public	$53
40	Maxis Inc.	Nil	$52	Maxis Inc.	Public	$52
41	Caere Corp.	Sonata, Bangalore	$52	Caere Corp.	Public	$52
42	Connectix Corp.	Nil	$48	Connectix Corp.	Private	$48
43	Stac Electronics	Infosys Technologies, Bangalore	$46	Stac Inc.	Public	$46
44	Activision Inc.	Nil	$46	Activision Inc.	Public	$46
45	State of the Art Inc.	Nil	$46	State of the Art Inc.	Public	$46
46	ON Technology Corp.	Nil	$44	ON technology Corp.	Public	$44
47	INSO Corp.	Nil	$43	INSO Corp.	Public	$43
48	MapInfo Corp.	Tata Elxsi, Bangalore	$41	MapInfo Corp.	Public	$41
49	Visio Corp.	Datapro Infoworld, Pune	$39	Visio Corp.	Public	$39
50	Datastorm Technologies Inc. (acquired by Quarterdeck Corp.)	Unison Computers, Bombay	$39	Datastorm Technologies Inc.	Private	$39
51	Best Programs Inc.	Nil	$38	Best Programs Inc.	Private	$38
52	Softdesk Inc.	Nil	$36	Softdesk Inc.	Public	$36
53	XcelleNet Inc.	Nil	$34	XcelleNet Inc.	Public	$34
54	MECC	Nil	$34	MECC (Minnesota Educational Computing Corp.)	Public	$34
55	Edmark Corp.	Nil	$32	Edmark Corp.	Public	$32
56	Peachtree Software Inc.	Nil	$32	Automatic Data Processing Inc.	Public	$1,195
57	Primavera Systems Inc.	Nil	$30	Primavera Systems Inc.	Private	$30

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THE PC MAGAZINE 150

Rank	Company (or division)	Indian subsidiary/partners	Worldwide PC software revenues, 1995 (millions)	Parent company	Ownership of parent company	Parent company's revenues 1995 (million)
58	Expert Software	Nil	$28	Expert Software	Public	$28
59	Timberline Software Corp.	Nil	$25	Timberline Software Corp.	Public	$25
60	SystemSoft Corp.	Nil	$25	Timberline Software Corp.	Public	$25
61	Software Publishing Corp.	BPB, NIIT, New Delhi	$24	Software Publishing Corp.	Public	$24
62	Living Books	Nil	$24	Random House/Broderbund	Joint Venture	$24
63	Traveling Software Inc.	Infomart, Bangalore; Optima Software, Hyderabad	$23	Traveling Software Inc.	Private	$23
64	IQ Software Corp.	Nil	$22	IQ Software Corp.	Public	$22
65	Pro CD Inc. (acquired by Acxiom Corp.)	Nil	$22	Pro CD Inc.	Private	$22
66	IMSI	Nil	$21	IMSI (International Microcomputer Software Inc.)	Public	$21
67	Asymetrix Corp.	Svam, New Delhi; DBS, Madras	$20	Asymetrix Corp.	Private	$20
68	Systems Plus Inc.	Nil	$20	Systems Plus Inc.	Private	$20
69	Persoft Inc.	Svam, New Delhi	$19	Persoft Inc.	Private	$19
70	Eagle Point Software Corp.	Nil	$19	Eagle Point Software Corp.	Public	$19

LAN HARDWARE

Rank	Company (or division)	Indian subsidiary/partners	Worldwide LAN hardware revenues, 1995 (millions)	Parent company	Ownership of parent company	Parent company's revenues 1995 (million)
1	Cisco Systems Inc.	Cisco India, New Delhi; Apcom, Madras; Datacraft-ICIM, Bombay; HCL-HP, New Delhi; Microland, Bangalore; TUL, Bombay; UB Networls, Bangalore	$2,667	Cisco Systems Inc.	Public	$2,667
2	Bay Networks Inc.	Bay Networks India, New Delhi; Datacraft-ICIM, Bombay; Microland, Bangalore; Ramco Systems, Madras; Unicorp, New Delhi	$1,727	Bay Networks Inc.	Public	$1,727
3	3Com Corp.	3Com India, New Delhi; Building Networks Automation, Bangalore; CMS, Bombay; Exelan, Madras; Godrej Trading, Bombay	$1,727	3Com Corp.	Public	$1,727
4	IBM Corp., Networking Hardware Division	TISL, Bangalore	$1,260*	IBM Corp.	Public	$71,940
5	U.S. Robotics Corp.	Microsense Computers, Bombay	$1,092	U.S. Robotics Corp.	Public	$1,092
6	Cabletron Systems Inc.	Apcom, Madras; PCS-DS, Unicorp, New Delhi; Zenith Computers, Bombay	$1,000	Cabletron Systems Inc.	Public	$1,000
7	Digital Equipment Corp., Network Product Business	Digital Equipment India, Bangalore; CMS, Godrej Pacific, Bombay; IT&T, New Delhi	$590*	Digital Equipment Corp.	Public	$14,440
8	Hewlett-Packard Co., Workgroup NetWorks Division	Hewlett-Packard India, New Delhi; CMS, Godrej Trading, Bombay; HCL-HP, New Delhi; Zenith Computers, Bombay	$410*	Hewlett-Packard Co.	Public	$33,500
9	Madge Networks Inc.	Godrej Trading, Bombay	$402	Madge Networks Inc.	Public	$402
10	UB Networks Inc.	UB Networks, Advantec Network Systems, Wipro, Bangalore	$225*	Tandem Computers Inc.	Public	$2,262
11	Standard Microsystems Corp.	Nil	$201	Standard Microsystems Corp.	Public	$350
12	Ascend Communications Inc.	Nil	$150	Ascend Communications Inc.	Public	$150
13	Fore Systems Inc.	Intercon Systems, New Delhi	$145	Fore Systems Inc.	Public	$145
14	Microcom Inc.	Datacraft-ICIM, Bombay	$127	Microcom Inc.	Public	$127
15	Shiva corp.	T-Net, New Delhi	$94	Shiva Corp.	Public	$94

*Estimated

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PC Magazine Top 150 Companies

THE PC MAGAZINE 150

Rank	Company (or division)	Indian subsidiary/partners	U.S. revenues 1995 (millions)	Units shipped in U.S., 1995 (thousands)	Parent company	Ownership of parent company	Parent company's revenues 1995 (millions)
PRINTERS							
1	Hewlett-packard Co.	Hewlett-Packard India, New Delhi; CMS, Bombay; ECIL, Hyderabad; Godrej Trading, Bombay; HCL-HP, New Delhi; Zenith Computers, Redington, Bombay	$4,365	6,944	Hewlett-Packard Co.	Public	$33,500
2	Canon Computer Systems Inc.	Network, New Delhi	$962	2,744	Canon Inc.	Public	$21,000
3	Epson America Inc.	Wipro, Bangalore; Redington, Digital World, Bombay; IT&T, New Delhi	$767	1,775	Seiko Epson Corp.	Public	$4,970*
4	Apple Computer Inc., Apple America's Division	Apple Computer, Bangalore; Odin Computers, New Delhi; Tangerine, Bombay; Wipro, Bangalore	$509	815	Apple Computer Inc.	Public	$11,379
5	Lexmark International Inc.	CMS, Bombay; Alphabetics, New Delhi; TVSE, Bangalore	$437	664	Lexmark International Inc.	Public	$2,200
6	Okidata	Nil	$351	812	Oki Electric Industry Co.,Ltd.	Public	$8,550*
7	Panasonic Communications & Systems Co.	Godrej Trading, Bombay	$138	536	Matsushita Electric Industrial Co., Ltd	Public	$68,345*
8	Digital Equipment Corp.	Digital Equipment India, Bangalore; CMS, Godrej Trading, Bombay; IT&T, New Delhi	$130	323	Digital Equipment Corp.	Public	$14,440
9	Brother International Corp.	Godrej Trading, Bombay	$106	232	Brother Industries Ltd.	Private	$2,020
10	Tektronix Inc.	Tektronix India, Bangalore; Hinditron, Godrej Trading, Bombay	$105	22	Tektronix Inc.	Public	$1,670
MONITORS							
1	NEC Technologies Inc., MultiSync Display Division	Byte Systems, Calcutta; Digital World, Bombay; Tata Elxsi, Bangalore; Redington, Bombay	$745	1,114	NEC Corp.	Public	$36,710*
2	Sony Electronics Inc., Information Technology of America	Sony India, Vintron, New Delhi	$730	1,162	Sony Corp.	Public	$42,000
3	Samsung Electronics America, Information Media Divison	Samsung India, DCM-DS, Reasonable Computers, New Delhi	$728	3,072	Samsung Group	Public	$93,930*

* Estimated

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5. Soft Turn-on delay	Nil	Nil	7 Sec
6. Efficiency	90 to 95 %	Less than 80 %	95 to 98 %
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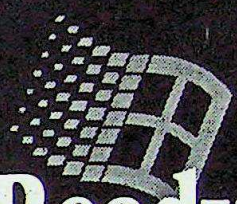
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THE PC MAGAZINE 150

Rank	Company (or division)	Indian subsidiary/partners	U.S. revenues 1995 (millions)	Units shipped in U.S., 1995 (thousands)	Parent company	Ownership of parent company	Parent company's revenues 1995 (millions)
4	Philips Consumer Electronics Co.	Philips India, Aditya Promoters, New Delhi	$551	2,205	Philips electronics N.V.	Public	$40,200
5	ADI Systems Inc.	Nil	$548	1,512	ADI Corp.	Public	$556
6	LG Electronics U.S.A. Inc.	Aditya Promoters, New Delhi	$507	2,108	LG Group	Public	$78,657*
7	Acer Peripherals Inc.	Wipro, Bangalore	$440	1,785	Acer Inc.	Public	$5,700
8	MAG Innovision	Nil	$379	936	MAG Innovision Co. Inc.	Private	$417
9	CTX International Inc.	Nil	$305	805	Chuntex Electronic Co., Ltd.	Public	$550
10	Tatung Company of America	Zenith Computers, Bombay	$295	1,375	Tatung Co.	Public	$3,500
HARD DISKS							
1	Seagate technology Inc.	ACI Infotech, Bangalore; Aprom, Madras	$3,177	9,133	Seagate Technology Inc.	Public	$5,500
2	Quantum Corp.	Spectra Innovation, Bangalore	$2,121	8,630	Quantum Corp.	Public	$4,174
3	IBM Corp.	TISL, Bangalore	$1,450	6,115	IBM Corp.	Public	$71,940
4	Western Digital Corp.	Nil	$1,279	5,485	Western Digital Corp.	Public	$2,430
5	Conner Peripherals Inc.	Nil	$1,240	5,398	Conner Peripherals Inc	Public	$5,453
GRAPHICS/VIDEO BOARDS							
1	Diamond Multimedia Systems Inc., Visual Systems Division	Media Tech, New Delhi; DBS, Madras; Spectra Innovations, Bangalore	$227	1,695	Diamond Multimedia Systems Inc.	Public	$460
2	ATI Technologies Inc.	Nil	$147	751	ATI Technologies Inc.	Public	$273
3	Matrox Graphics Inc.	Benchmark Microsystems, Madras	$123*	500*	Matrox Electronic Systems	Private	$300*
4	STB Systems Inc.	Nil	$99	600*	STB Systems Inc.	Public	$141
5	Number Nine Visual Technology Corp.	Nil	$82	458	Number Nine Visual Technology Corp.	Public	$116

* Estimated

METHODOLOGY

We gathered the data for this compilation in April. The basic information for each category (leading companies, their revenues per category and—where included—numbers of units shipped in that category) was provided by research organizations specializing in coverage of these product areas. Specifically, we relied upon information provided by Soft•letter (PC software), the Dell'Oro Group (LAN hardware), Stanford Resources (monitors), Dataquest (hard disks), International Data Corp. and John Peddie Associates (graphics/video boards), and Computer Intelligence (PCs, PC servers, and printers).

Because there are significant differences among the PC industry's various market segments, the types of data varied among product categories. For some categories we captured U.S. revenues; for others we gathered worldwide revenues. Although we emphasized U.S. sales in most categories, we also included non-U.S. vendors with significant U.S. market share. For large, diversified companies such as IBM, Digital, Hewlett-Packard, and Apple, we attempted to isolate data for specific divisions. In every instance we relied upon the experts noted above to suggest appropriate ways to gather and report data on the companies included here.

We then acquired additional data on each company included in these charts: its location, telephone numbers, World Wide Web address, and its corporate parent's annual revenues. In most instances that information came directly from each company or from company documents publicly available (annual reports, Securities and Exchange Commission filings, press releases, and Web pages). In every instance we tried to confirm all data with the companies covered.

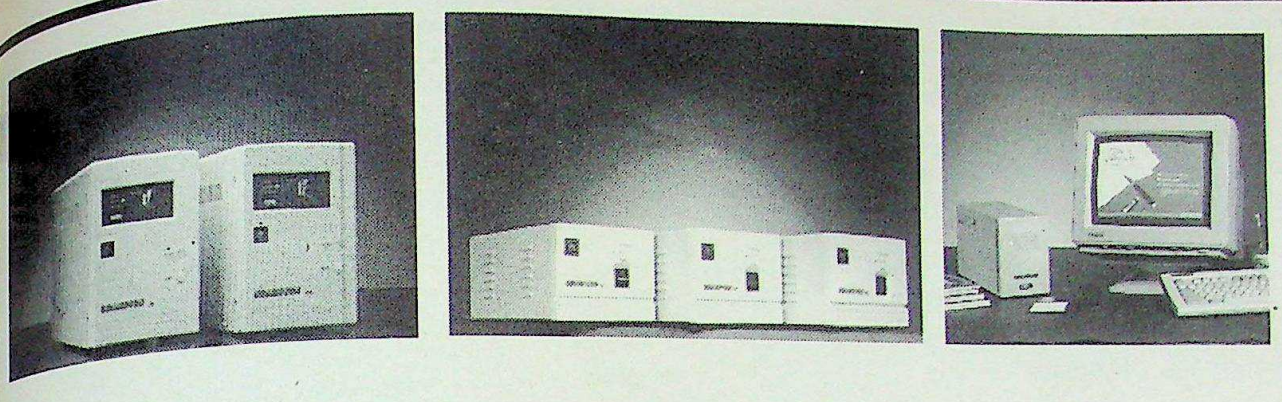
In order to ensure comparability among the companies within each category, we used units-shipped and financial data for calendar 1995. If a company's fiscal year ended anywhere from November 30, 1995, to January 31, 1996, we accepted it as equivalent to the calendar year 1995. For companies whose fiscal years ended outside that two-month period we gathered data by individual quarters in 1995 to determine total numbers for calendar 1995. All revenue figures are in U.S. dollars. Where necessary we calculated U.S. dollar amounts for non-U.S. companies using exchange rates in effect at the end of April.

In a few cases exact information was unavailable (particularly for private companies and for companies that do not break out data along the lines required for this project). In those instances we turned to outside analysts—particularly representatives of the data sources cited above and Jardine Fleming Securities, Tokyo (for data on Pacific Rim companies), and various corporate directories. Any number that could not be directly verified by a company is noted as "estimated" in the charts.

Our Contributors: JAKE KIRCHNER is the editor of *PC Magazine*. The data for the *PC Magazine* 150 was compiled under the direction of JUDY DEYOUNG, editorial resesearch manager; by editorial researchers ROBERT DALY, DAVID FRANK, JOSH LEVY, ARIE MOLLER, and RICHARD S. SHIM; and by NANCY SIRAPYAN, editorial librarian, and RITA APRAHAMIAN, assistant to the editor.

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Table I: Foreign UPS Companies in the Indian Market

Foreign Company	Indian Subsidiary/ Partners
1. AMI, USA	United Informatics (P) Ltd B3 Pal Mohan Sadan 26/32 Rajendra Place New Delhi 110 008 Tel:5751505 Fax:5741404
2. APC, USA	American Power Conversion 5A Century Plaza Anna Salai Madras 600 018
	Compuage Electronics 3 Dhuru Building 329 Vithalbhai Patel Road Off Lamington Road Bombay 400 014 Tel:3851573, 3873436 Fax:3877836
	Datapro Infoworld 113/1 Koregaon Park Pune 411 001 Tel:638975, 630326 Fax:634813
	Onward Technologies Krislon House Saki Vihar Road Saki Naka, Bombay 400 072 Tel:8362097, 8221569 Fax:8364180
	Ritika Electronics F 35 Okhla Industrial Area Phase I, New Delhi 110 020 Tel:6819362, 6814520 Fax:6810460
	Vidur & Company 707 Manjusha 57 Nehru Place New Delhi 110 019 Tel:6223085, 6404215 Fax:6219159
	Vintron F34 Okhla Industrial Area Phase I New Delhi 110020 Tel:6814520, 6811980, 6813680 Fax:6810460
3. Best, USA	Innovative Power Information Bombay Tel:2872100, 2875907 Fax:2852981
	Powertron Products G104 Kalkaji New Delhi 110 019 Tel:6420206 Fax:6429714
	Prashanth Electronics Bangalore Tel:562456 Fax:562456
	Uni Marketing Associates Madras Tel:8272193, 8264625 Fax:8250088
4. Cellpower, Taiwan	Spaceage Electro Offiquipments 2nd Floor 16 Ganesh Chandra Avenue Calcutta 700 013 Tel:275761 Fax:262106
5. Fiskars, Finland	Next Generation Business Power Systems 902 Bhikaji Cama Bhawan 11 Bhikaji Cama Place New Delhi 110 066 Tel:671343 Fax:6883629
6. Fuji Electric Co. Japan	Instrumentation Ltd FE/2 Malviya Industrial Area Jaipur 302 017 (Rajasthan) Tel:514802, 511727
7. High Performance Drives Inc.,USA	Numeric Power Systems 62 Dr Radhakrishnan Salai IIIrd Floor, Mylapore Madras 600 004 Tel:4990300 Fax:4936500
8. Liebert, USA (Emerson)	Tata Liebert Plot No C/20 Road No 19 Wagle Industrial Estate Thane 400 604 Tel:5328405, 5328397 Fax:5328358
	Godrej Pacific Plant 19A Pirojshanagar Vikhroli Bombay 400 079 Tel:5171166
9. Merlin Gerin, France	Numeric Power Systems 63 Dr Radhakrishnan Salai Mylapore Madras 600 004 Tel:4990300 Fax:4936500
10. Powercom, Taiwan	Kunhar Peripherals A23 Shri Ram Industrial Estate 2/F 13 GD Ambedkar Road Wadala Bombay 400 031 Tel:4130442, 4130646 Fax:4130218
11. Savin Electronics Israel	Savik Electronics 102 GIDC Engineering Estate Sector 28 Gandhinagar 382 028 Tel: 22584, 22680 Fax: 20112

Continued.....

the incoming voltage may vary from [illegible] to 270V, whereas in USA the change [illegible] be hardly +/-10%. Similarly, the [illegible] line frequency variation in India is [illegible] more than in the USA. The back-up [illegible] required in advanced countries may [illegible] ly be a few minutes; in India it may [illegible] to many hours. The Indian UPS/CVT designed for India, will take care of [illegible] factors, but a power conditioner [illegible] elsewhere may or may not be designed [illegible] such a vast range of deviations. [illegible] Indian UPS/CVT manufacturers [illegible] tently claim that their equipment are [illegible] ter than imported ones because the [illegible] have not been designed keeping In[illegible] conditions in mind. This may be true [illegible] some foreign brands, untrue for others. [illegible] good many UPS are designed and built [illegible] advanced countries exclusively for [illegible] ports, with the Third World conditions [illegible] mind, for example AMI. Besides, some [illegible] foreign branded UPS are being manufactured in Third World countries for the [illegible] World market. For example, some UPS models of USA's Emerson, Japan's Fuji and Denmark's Silcon are being manufactured in India by Tata-Liebert, Instruments Ltd, and El-pan Electricals respectively. Taiwan's Cellpower UPS systems currently imported and sold in India by Calcutta-based Spaceage Electro Offiquipments, will soon be manufactured in India by Spaceage. Such power conditioners can very well take care of local power supply anomalies.

IMPORTED VS INDIAN

When should one prefer foreign UPS/CVT to an Indian one? For CVTs and Offline UPS, one need not even consider foreign products. Indian products, based upon Indian technology, which is state-of-the-art, can very well take care of the customer's needs. But for Online UPS in the higher KVA category, one may consider imported UPS. For major computerization and huge networking one may require intelligent UPS. In such cases, one should go for foreign brands. The market for higher KVA category UPS is hardly 5% in India. When making the choice for a foreign UPS, one must consider a few factors. First, the availability of service in the long run. Some foreign brands [illegible] merely resold through distributors. Neither the distributor nor the manufacturer may have a long-term interest in servicing and supporting the product. Second, the availability of spares and their cost after warranty. If the UPS is straightaway [illegible]

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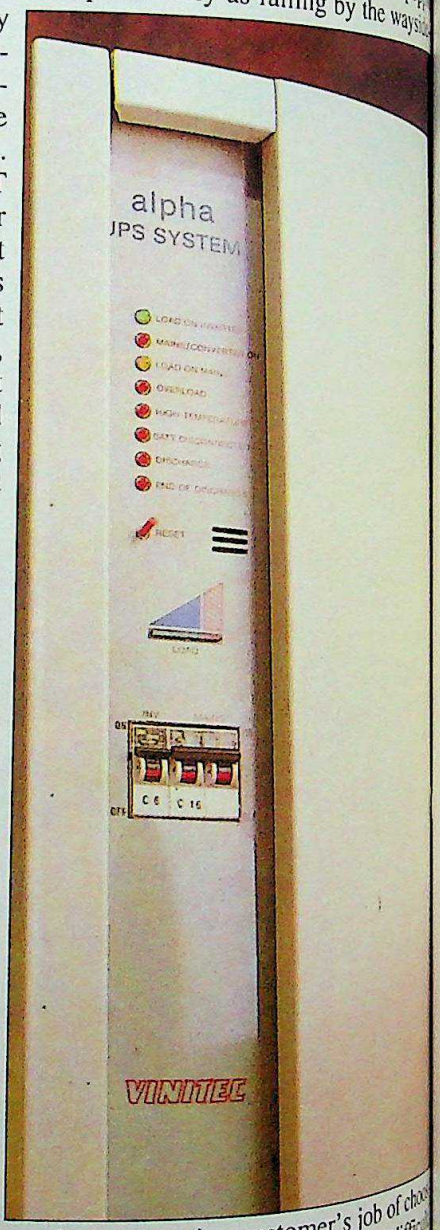
Foreign Company	Indian Subsidiary/ Partners
12. Siemens, Germany	Siemens 1086 Appasaheb Marathe Marg, Prabhadevi Bombay 400 018 Tel:4301548 Fax:4375993 Guard Electronics Systems S 60 FIEE Okhla Industrial Area Phase II, New Delhi 110020 Tel:6849337, 6849338 Fax:6822812
13. Silcon, Denmark	Foresight Power Systems 63/1 Railway Parallel Road Kumara Park West Bangalore 560 020 Tel: 367679 Fax: 3368296
14. Systel Development & Industries, Israel	Adtech Power Systems TC 9/908 Sasthamangalam Trivandrum 695 010 Tel:68462, 69445 Fax:69456
15. Tripplite, USA	Gebbs India 13th Street, Central Road MIDC Marol Andheri East Bombay 400 093 Tel: 8362133 Fax: 8350209 Godrej Pacific 19A Pirojshanagar Vikhroli Bombay 400 079 Tel:5171166 Gujrat Hirel Controls Shanti Chambers Navrangpura Ahmedabad 380 009 Tel:409309 Fax:8251247 Prime Source Technologies Madras Tel:8282239 Fax:8251247 Redington India 1004 Dalmal House Jamna Lal Bajaj Marg Nariman Point Bombay 400 021 Tel:2832478 Tangerine Infomatique Bombay Tel: 8214061 Fax: 8363361
16. Victron, Germany	Vinitec Electronics H33 Bali Nagar New Delhi 110015 Tel: 9194676, 535039
17. Viusonic, Japan	Integrated Equipment 1522 Ansal Tower 38 Nehru Place New Delhi 110 019 Tel: 6462300, 6214702 Fax: 6846815

ported by the local supplier, spare availability and replacement can become a major problem. And lastly, ascertain that the UPS has adequate back up, and can withstand hostile Indian power conditions. As already noted above, some foreign UPS can, others cannot. Table 1 is a list of foreign UPS brands available in India, and their sources.

HOW TO CHOOSE?

The first step in choosing the best UPS/CVT is to know the power rating of the machine required. Table 2 gives the load ratings of various products commonly used. Evaluate your total load by summing up the individual loads of equipment used. Ensure that the rating of the UPS is not less than your total load. When buying a CVT, let your CVT rating be as close as possible to your total load. If the CVT is not operated at full load, lot of power is dissipated as heat, which not only wastes power but also reduces CVT life. In other words, when choosing the rating of your best UPS, you can cater to redundancy and future expansions; but when choosing your best CVT, stick to your present needs only.

The next step in choosing the best UPS/CVT is to identify the brand which can provide the best quality and after-sales support. The slew of products in the market make this step hazardous. We do not propose to pinpoint any "best" UPS/CVT brand in this story. It is not merely the relativity of the expression "best" for different mindsets that makes such an exercise futile, but also the uncertainties involved in choosing and comparatively evaluating the parameters which may firmly and definitively establish a brand name as the best. Nevertheless, the reader can get a fairly good picture of the brandnames wherein he can choose his best UPS/CVT if, along with a clear idea of his own requirements, he can have adequate information of the money, skills, and labor which have gone into the making of his machine, and the kind of service available to him after purchase. Indeed, some believe that service and support is a factor as crucial as quality assurance in enabling a person decide which is the best UPS/CVT for him. The Indian buyer is likely to be confused because of a large unorganized sector. An entrepreneur can venture into power conditioner manufacturing with an investment of hardly Rs 500,000, and operate from his backyard or garage. ... there are any number of such UPS/CVT manufacturers in India. On the other hand, companies like Elnova, Elent, and B... have invested millions to manufacture the very same products. Obviously, the ... going into the final products between ... two categories of manufacturers are ... apart, resulting in a sea of differ... between the qualities of the end prod... From a plethora of UPS/CVT manu... turers—250, by a very conservative ... mate, with as many companies pop... up routinely as falling by the way...



the prospective customer's job of choo... ing the best UPS/CVT becomes difficu...

A brief understanding of how quality ... conscious UPS/CVT manufacturers ... sure quality can make the reader mo... knowledgeable in choosing. Our editor... team visited the manufacturing facilit... of some UPS/CVT manufacturers, w... were willing to show us their plant (not ... the manufacturers we approached ...

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DEALERS WANTED IN UNREPRESENTED AREAS

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Table 2: Typical Load Ratings

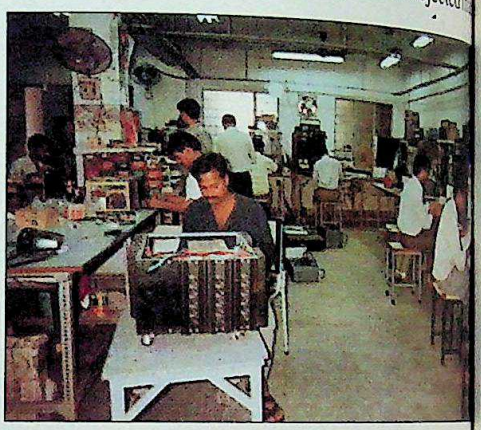
Manufacturers	Model	Power Rating
IBM	PC	100 W
IBM	PC/XT	150 W
IBM	PC/AT	200 W
IBM	PC Server 500	700 W
IBM	Personal Systems/2 Model 30	70 W
IBM	Personal System/2 Model 60	207 W
IBM	Personal System/2 Model 80	225 W
IBM	Value Point 425SX	250 W
IBM	PS/2 Server 77i	300 W
IBM	PS/2 Premier 95 w/VGA	400 W
IBM	Typ. Pentium System w/VGA	450 W
Olivetti	SNX 140/160-R	600 W
Apple	Lisa	130 W
Apple	Macintosh Classic	75 W
Apple	III	120 W
Compaq	PC W/Hard Disk	175 W
Compaq	Presario 425	150 W
Compaq	Prolinea	200 W
Compaq	System Pro w/VGA	350 W
Compaq	Prosignia 486/66/VGA	500 W
Unisys	U6000/35, Fully configured	800 W
DEC	Micro VAX	900 W
HP	9000 834	1,250 W
Sun	Sparc Server 1000	2,000 W
Cisco	3000 Router	125 W
Epson	PC	100 W
TI	PC	160 W
Commodore	PC	100 W
Color monitor		50-70 W
B&W/ monochrome monitor		35-50 W
Modems		15-30 W
L&T	Printer, L80	90 W
L&T	Printer, E32	110 W

What should be your maximum UPS/CVT rating? Check the power rating from the above chart of the various loads you want to connect, and add them. Ensure that this summation does not exceed the UPS/CVT rating.

Courtesy: Elnova.

tended this courtesy for reasons that can be easily understood). We also sent questionnaires to almost all the known UPS/CVT manufacturers in the country, inviting facts about their infrastructural facilities, quality control, R&D, dealer and service network, and other information that can help the reader in knowing the kind of input that goes into the product. Not surprizingly, the response was poor, in contrast with the avalanche of responses we had received for our cover story *UPS/CVT: The Struggle for Power* (May 1996, *PCMI*). The reason is not far to see. The focus of the earlier story was on what the market had to offer, and every manufacturer wanted to offer his products; the present focus is to study the measures taken to ensure a quality product so that the customer is able to choose his best UPS/CVT. Table 3 gives a sample taste of the diversities that mark Indian UPS/CVT manufacturers. All in all, the number of UPS/CVT manufacturers who have invested in quality is few and far between.

Besides visiting some UPS/CVT manufacturing plants, we also telephonically interviewed a cross-section of UPS/CVT users to find out their preferences, so that users too get involved in our search for the best UPS/CVT. As these users were only from Delhi, the preferences indicated may have a local geographical bias. For CVTs, the preference was clearly decisive—it's Elent or Bhurji. For Indian UPS, the choice was wider, with Elnova commanding an edge. We have chosen to study how Elnova and Elent ensure that their products are the "best"—according to the companies—in the market. The fact that we have chosen these two companies—Bhurji did not answer our questionnaire—in no way means that *PC Magazine India* has come to the judgment that Elnova UPS and Elent CVT are the best. Nevertheless, the study is indicative of what goes into a product that can aspire to be the best in the market.



Final testing department at Elnova.

CASE STUDIES

With an equity base of Rs 25 million, working capital of Rs 32 million, and an investment of Rs 6 million in plant and machinery (purchase price), Elnova is among few Indian UPS manufacturers who have invested heavily in the project. The infrastructure comprises of 17,400 sq. ft. of floor space, inclusive of manufacturing, R&D, and marketing and customer support. All Elnova products have been developed in-house, by its R&D, now comprising 14 persons in a staff strength of 140. Elnova R&D, with a budget of 3% of net sales (Rs 103 million in 1995-96), takes into account the availability of components in India and the Indian ground realities to make the product suitable for India.

Elent, with a turnover of Rs 82.2 million in 1995-96, floor area of 8,500 sq. ft., 95 employees, and an employed capital of Rs 15 million, has created for itself a very strong niche in CVTs. The company spends 2.5% of its turnover on R&D and QA. Among the major achievements of its R&D are: innovative designs have allowed Elent to keep its CVT prices stable inspite of massive rise in raw material prices during the last four years; capacitors in the resonating circuit have least failure rate even under extreme temperatures; CVTs are safe for continuous operation even under high ambient temperatures; widest operational frequency r (especially on the lower side) ensur the phenomenon of ferro-resonanc mains active at the line frequency a as 48 Hz and the CVT continues to the specified performance, at the full load, at unity power factor over the line voltage swing.

Elnova and Elent have a similar orate quality assurance(QA) progra to prevent the operation of Murphy's that if something can go wrong, it wrong. QA has the following asp incoming inspection of raw materia segregation and disposal of rejected

rials; inprocess inspection; life-testing final inspection/calibration; and docu tation at each stage. The incoming ins tion of materials ensures that wrong materials do not reach the produc floor. Not all materials can be p through this stage; QA decides materials should pass the test and at level. This depends on results obta from the production line and field re ing premature failures, as also the ba ground, reputation, quality control documentation procedure followed b manufacturer whose material is being ed. The material selected for inco tests would go through visual chec visual and electrical checks (100%-ch ing or random sample checking). W visual inspection would include che parameters like finish, dimensions, c printing, solderability, and so on, ele cal inspection would be based on tional checking of the component or cir ing for certain critical parameters.

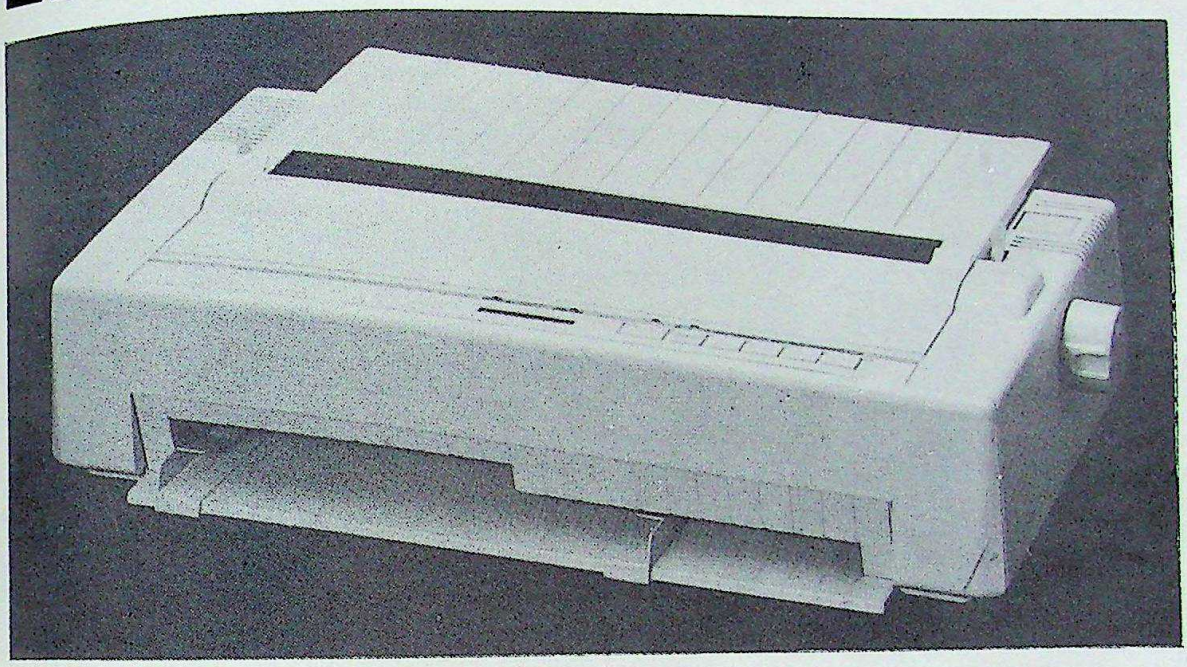
The inprocess QA inspection bec functional once the material is iss from stores on the production line. Per ic random sample basis monitorin done at various stages of the produc process. Under life-testing QA doc additional sample basis checking to

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itor the units under life tests for abnormal heating or malfunctioning and premature failure. Equipment received from production line has to go through a load/soak test in normal environmental conditions, and at times also in other environmental conditions specified by customers. The equipment is fully checked, re-calibrated if required, and sent for final fitting and finishing. The final QC inspection stage is for final pre-pack checking of equipment and preparation of test report.

One important QA aspect which seems to be unique with Elnova and Elent is the ability, through the use of a custom software, to trace back which worker has done which job on the equipment even after years. In case of a manufacturing defect, the erring mechanic/engineer can be traced and blame apportioned. This ability to trace back manufacturing defects keeps all involved in production on their tiptoes.

Elnova has over 182 dealers trained to market and support its products across the country. Elent has a national network of 185 dealers. There are companies like New Delhi's Vinitec, Gandhinagar's Suvik, and Bangalore's Foresight which have been awarded ISO certification... mark of quality. Then there are comp... like Bhurji, whose products are pra... quality even by its rivals in the ... More companies can be listed who ... made quality their hallmark in their ... way. In other words, there are UPS/... manufacturers in India with whom ... ity is an obsession. But their numbers ... few and far between, and the prospe... UPS/CVT buyer must keep his nose ... to the grindstone when smelling fo... best UPS/CVT.

(By PCMI Editorial ...

Table 3: The table gives a bird's eye-view of the infrastructural facilities, R&D, and services and support of some companies manufacturing UPS/CVT in India.

Company	T/o from UPS/CVT (1995-96)	Infrastructure	R&D investment	Products	Service & support
3 EM Kapoor Building Apartment 3, IIIrd Floor F39 East of Kailash, New Delhi 110 065 Tel: 6474538	—	100 employees, including 15 engineers	5% of t/o	UPS 500 KA-40 KVA	Sales and support offices located at Bangalore, Chandigarh, Madras
Aar-Em Electronics 17B Hadapsar Industrial Estate Pune 411 013 Tel: 672083/672376; Fax: 671413	Rs 40 mn in calendar year 1995	75 employees; floor area 6,000 sq.ft.	—	UPS	National network of 50 dealers
Anvi Electronic Systems 10 Vaishali Industrial Estate-I Mhatre Wadi, Dahisar (W) Bombay 400 068 Tel: 8921674/8937147; Fax: 8933571	—	14 employees; Rs 380,000 cost of machinery	15% of t/o	CVT	Dealer n/w in major towns
Bhurji Electronics 107 Udyog Vihar, Dundahera 122 016 Gurgaon Tel: 341264	Rs 7.5 mn	3,000 sq.yds. covered area; Rs 100 mn invested in land, plant, and machinery	—	CVT 150VA-7.5 KVA	National network of dealers/distributors
Cliff's Electronics 331/A1-5/K1 GIDC Industrial Area, Makarpura Baroda 390 010 Tel: 444100/441970; Fax: 441971	Rs 2.6 mn	19 employees; 2,800 sq. ft. floor area	—	UPS, CVT	Service centers in Gujarat, Maharashtra, and Rajasthan
Consul Consolidated 4/329-A Old Mahabalipuram Road Madras 600 041 Tel: 4926651/6652; Fax: 4912972	Rs 80 mn (from all products)	150 employees; 8,000 sq. ft. floor space	Rs 700,000 p.a;	UPS up to 10 KVA	Branches and dealer network spread all over the country
Deecee Electrosystems 32B Ritchie Road Calcutta 700 019 Tel: 4758742	—	Employs 38 persons in three plants with total floor space of 4,400 sq.ft; cost of machinery Rs 450,000	1% of t/o	UPS	—
Electronic Enterprises 67 DSIDC Complex Okhla, Phase I, New Delhi 110 020 Tel: 6818608/6810515 Fax: 6818608	Rs 78.34 mn (total Rs 84.95 mn)	95 employees; floor area 8,500 sq.ft.	2% of t/o	CVT 50 VA-5 KVA UPS 250 VA-1 KVA	National network of 185 dealers
Electronic Instruments & Devices 652/B Dr Rajakumar Road II Stage, Rajajinagar, Bangalore 560 010 Tel: 3321517	—	30 employees; floor space 2,500 sq. mtrs	3% of t/o	UPS	Marketed by Alacrity Electronics, Madras
Elnova Ltd B165 Okhla Industrial Area Phase I New Delhi 110 020 Tel: 6810172/6810569 Fax: 6816070/6811667	Rs 114 mn	Employs 140 persons, with 14 in R&D, 90 in manufacturing, and 36 in marketing and customer support; floor space 17,400 sq.ft.	3% of net sales	UPS 250 VA-2 KVA CVT 500 VA-5 KVA	National network of 182 dealers

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Eltech 63B Industrial Estate Nangargaon Lonavala 410 401 Maharashtra Tel: 73825/73875 Fax: 73875/342446	130 employees; 10,000 sq.ft. floor space; Rs 12 mn investment in fixed assets like building, plant, and machinery	800 sq.ft devoted exclusively to R&D	—	UPS 1-40 KVA	Regional offices at Bangalore, Bombay, Calcutta, Delhi, Hyderabad and Pune; servicing centers all over India; representative in Singapore
Foresight Power Systems 63/1 Railway Parallel Road Kumara Park West, Bangalore 560 020 Tel: 367679/369787/3345519 Fax: 3345791	—	60 employees; 5,000 sq. ft. floor space; Rs 500,000 cost of machinery	Rs 600,000 p.a.	Online UPS 3-3,000 KVA Offline 300 VA-2 KVA	Offices in 9 cities, dealers in 12 cities, mostly in S. India
MEL Systems and Services 7A, II Cross Street, Thirumalai Nagar Perungudi, Madras 600 096 Tel: 4928203/6903/6904 Fax: 4927488	95 employees; 11,000 sq.ft. floor space; capital employed Rs 16 mn; investment in plant and machinery Rs 8.3 mn	Rs 2 mn	UPS	—	—
Multiline Telecom Ltd C24 South Extension I New Delhi 110 049 Tel: 4642233/55/99; Fax: 4602039	—	—	—	Sinewave offline UPS 350 VA-1.2 KVA	—
Numeric Power Systems 63 Dr Radhakrishnan Salai Mylapore, Madras 600 004 Tel: 4990300; Fax: 4995179	506 employees; machinery cost Rs 13.7 mn	5% of t/o	—	UPS	National network of service centers
Opto Instruments 627/1 Diamond Harbor Road, Behala Calcutta Tel: 4682275/4687492	Rs 9 mn	40 employees; floor space 4,000 sq.ft; cost of machinery Rs 200,000	Rs 200,000 p.a.	UPS-Ercisson range CVT 50 VA-5 KVA	Available in W. Bengal, Bihar, Orissa, Assam, Nagaland, Bhutan, Sikkim and M.P.
Perpetual Power Technologies 842A, 100 Ft Road Indiranagar Bangalore 560 038	Rs 100 mn	103 employees; two manufacturing units 5,000 sq.ft. and 1,500 sq.ft. area; cost of machinery Rs 2.75 mn	10% of earnings; the company claims to be the first in India to introduce Online UPS using power Mosfets.	UPS 500 VA-100 KVA	Regional offices at Bangalore, Bombay, Delhi, Calcutta, centers/dealers at Chandigarh, Bhopal, Jaipur, Guwahati, Hyderabad, and Madras
Powertron Products G104 Kalkaji New Delhi 110 019 Tel: 6420206/6429714 Fax: 6429714	Rs 28 mn	Employs 93 persons; three plants of 800, 2,000, and 3,000 sq. mts each	—	UPS 500 VA-30 KVA CVT 150 VA-15 KVA	—
Suvik Electronics Plot 102 GIDC Engineering Estate Sector 28, Gandhinagar 382 028 Tel: 22584/22680/22687 Fax: 02712-20112	Rs 22.5 mn (from all products)	125 employees; 12,000 sq.ft. floor space; Rs 20 mn investment in plant and machinery	Rs 200,000 p.a.	Source 2 UPS up to 10 KVA Dataguard Offline UPS up to 1 KVA Savin (Israel) UPS up to 160 KVA	Branch offices in Ahmedabad, Baroda, Bombay, Delhi, and Bangalore; service engineers at Aurangabad, Pune and Calcutta; network of distributors and dealers all over India.
Systematic Power Devices K.P. Compound, Jeri Meri Bombay	—	48 employees; 2,000 sq.ft. floor space; 2 engineers in R&D	2.5% of t/o	Offline UPS 250 VA-2 KVA CVT 50 VA-10 KVA	—
Tata Liebert Plot No. C-20, Road No. 19 Wagle Industrial Estate, Thane West Tel: 5328405/5302388 Fax: 5328358	Rs 400 mn	260 employees; 30,000 sq.ft. floor space; Rs 20 mn cost of machinery; 20 engineers in R&D	Rs 6 mn	UPS 250 VA-4,800 KVA	11 offices, 5 service centers, 60 authorized service partners across the country
Vinitec Electronics H33 Bali Nagar New Delhi 110 015 Tel: 5194676/535039 Fax: 5437539	Rs 50 mn	40 employees; works located at two places having more than 5000 sq. ft. area; machinery cost Rs 2.5 mn; 6 engineers in R&D	—	UPS 1-15 KVA	20 service centers all over India
Zener Electronics Jayalalitha Electronics Complex Block I, Shed No. 34 & 35 Thiru Vi-Ka Industrial Estate, Guindy Madras 32 Tel: 2345338/458664, Fax: 457592	Rs 100 mn (from various power conditioner products)	34 employees; 2,400 sq. ft. floor area	7% of t/o	UPS 1-15 KVA	Service network in major cities of South India, Pune and Bombay

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Create Secure User Profiles with Windows 95's Policy Editor

Publicly accessible computers, such as those in schools, require a significant degree of security to prevent abuse. The Windows 95 CD-ROM provides the tool you need to implement restrictive policies on such machines in the form of the Policy Editor (POLEDIT) application (see Figure 1). Unfortunately, the Windows 95 Resource Kit doesn't tell you how to use POLEDIT for standalone computers, so I developed a method of my own:

- ***Prepare the System.*** *Use Explorer to make backup copies of USER.DAT and SYSTEM.DAT, in case of emergency. Make sure you have at least 10MB free on the Windows drive to hold user profile information.*
- ***Enable User Profiles.*** *Launch the Password applet in Control Panel. Click the User Profiles tab, click the option Users can customize..., and check the two check boxes. Click OK; Windows will restart.*
- ***Create Profiles.*** *When Windows restarts, log on as User and allow Windows to create folders to hold your profile information. Shut down and log on again as Administrator, with a suitably obscure password, and again allow Windows to create profile folders. Don't forget this password!*
- ***Restrict User Access to Programs.*** *While logged on as Administrator, use Explorer to navigate to C:\WINDOWS\PROFILES\USER\STARTMENU. In this folder and those below it, delete any shortcuts to programs the user shouldn't be allowed to run, including every shortcut in the Recent folder. Be sure to delete shortcuts to POLEDIT, Regedit, and Explorer.*
- ***Install Policy Editor.*** *Launch the Add/Remove Software applet in Control Panel, click the Windows Setup tab, and press the Have... button. Navigate to the ADMIN\APPTOOLS\POLEDIT folder of the Windows 95 CD-ROM and install POLEDIT.INF. This will install POLEDIT and put it on the Accessories\System Tools submenu of the Programs menu. It will also place the critical policy template file ADMIN.ADM in the C:\WINDOWS\INF directory. If you don't have the CD, you can download POLEDIT from* http://www.microsoft.com *or CIS MSWIN.*
- ***Define Default User Policy.*** *Launch POLEDIT, create a new file, and add new users named User and Administrator. Double-click the Default User icon, select System | Restrictions, and check all four boxes. Select Shell | Restrictions and check the four boxes whose captions begin with Remove, plus the two that say Hide All Items on Desktop and Don't Save Setting at Exit. Do not check the Disable Shut Down command. Use Explorer to create a folder named C:\WINDOWS\PROFILES\DUMMY. Back in POLEDIT, select Shell | Custom Folders and check all the boxes, filling in the dummy folder name you just created for those that require paths. Click OK and save the file as CONFIG.POL.*
- ***Define User Policy.*** *Load the example policy file MAXIMUM.POL, click on the Default User icon, and choose Copy from the Edit menu. Reload CONFIG.POL, click on the User icon, and select Paste from the Edit menu. Double-click the User icon and choose Shell | Custom Folders. Click on the text of each check box in turn and, if an edit*

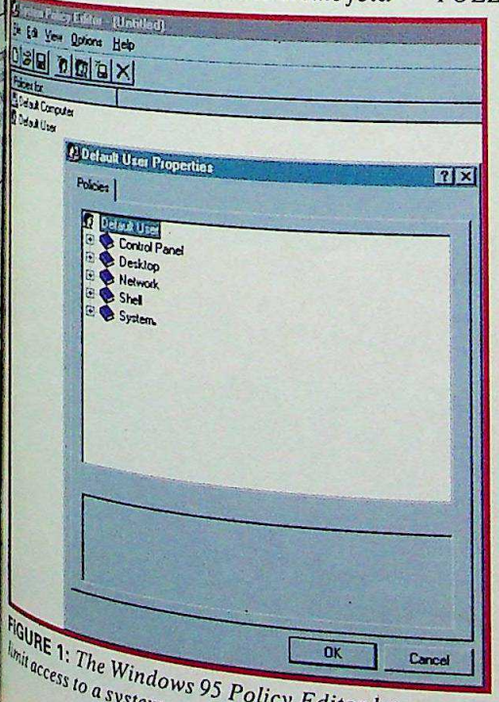


FIGURE 1: *The Windows 95 Policy Editor lets you limit access to a system.*

HIGHLIGHTS

HARDWARE Most PCs are set up for just two floppy disk drives, but it is possible to connect three or four to a single system. *Page 101*

SPREADSHEETS Date values can be used in Excel formulas, but only if you let the program know that 03/15/96 doesn't mean 3 divided by 15 divided by 96. *Page 103*

DATABASES Here's a third party tool that changes all forms, reports, and modules that reference the column when you rename it. *Page 104*

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box appears below, replace C:\WINDOWS with C:\WINDOWS\PROFILES\USER. Make sure all boxes remain checked. Select Control Panel | Passwords and check the Restrict box; then check the other four boxes that appear below. Under Shell | Restrictions, check Remove Run command, Remove Find command, Hide Drives in My Computer, and Don't Save Settings at Exit. Consult the Windows Resource Kit Help to determine what other restrictions you may wish to add, but be sure not to check Disable Shut Down command. Now go to the Shell | Restrictions and System | Restrictions and change any gray check boxes to blank.

- ***Define Administrator Policy.*** *Double-click the Administrator icon and go through the entire list of restrictions, setting every check box to blank, not gray. This protects the Administrator policy from being affected by the Default User policy.*
- ***Define "no user" Policy.*** *Log on again, but press Esc to close the log-on prompt. Run POLEDIT, select Open Registry from the File menu, and double-click Local User. Apply all the same restrictions you applied to Default User. Then log on as Administrator again.*
- ***Enable Policy Loading.*** *Load CONFIG.POL in POLEDIT, open the Default Computer icon, select System, and check Enable User Profiles. Under Network\Update, check Remote Update. Select Manual for the Update Mode, and enter C:\WINDOWS\CONFIG.POL as your path. Save CONFIG.POL. Now select Open Registry from the File menu, double-click Local Computer, and make the same change to the network update mode. Save changes and exit POLEDIT.*
- ***Test Policies.*** *Log on as User; check to see that the policy restrictions you specified are in place. Log on as Administrator and check that there are no restrictions. Now shut down and log on again, but use a new name and password. There should be no icons on the desktop and no programs available from the Start Menu (nothing to do but log on again). This time press Esc at the log-on prompt to bypass entering a user name. Again you should have no option but to shut down and log on again.*
- ***Protect Policies.*** *Log on as User and confirm that there is no way to run POLEDIT. For greater safety, change the file named ADMIN.ADM (in the C:\WINDOWS\INF folder) to something else. Use the DOS command ATTRIB to remove the read-only, hidden, and system attributes from the file C:\MSDOS.SYS, and load it into your favorite editor. Find the heading [Options] and change the Bootkeys= key to Bootkeys=0. If this key is not present under [Options], simply add it. Save the file and restore its read-only, hidden, and system attributes. This change prevents the user from breaking out of Windows 95's startup process. Finally, if the system BIOS permits, use its SETUP program to disable booting from a floppy disk.*

RICHARD TURNER, *Augusta, Georgia*

PC MAGAZINE: This may be one of the longest User-to-User letters we've ever published, but I think you'll agree that it's unusually valuable. Follow the steps here to give your system the maximum protection available in Windows 95 systems. Do note that each attempt by a user to log on with a new name will create a folder below C:\WINDOWS\PROFILES containing a copy of USER.DAT. You'll want to periodically delete all such folders except User, Administrator, and dummy.

If the MAXIMUM.POL and STANDARD.POL files mentioned here are not on your hard disk, look in the folder \ADMIN\RESKIT\SAMPLES\POLICIES on the Windows 95 CD-ROM. For help on the meaning of various policy restrictions, launch WIN95RK.HLP in the \Admin\Reskit\Helpfile folder.

Quick Disk Space Report in DOS 7

I've discovered a neat tip you can use in any DOS 7 box under Windows 95. If you want to see how much disk space is used or how much is still free and don't want to run CHKDSK on a huge hard disk to find out, you can use the following command:

```
DIR SDF /V
```

The first parameter can be any none[illegible] filename. The /V is the Verbose opti[on] gives extended information about the [files] and subdirectories. So the command is [used] DOS to show any files with that name, [and] with the extended information. Since [there] are no files with that name, you'll simply [see] the bytes free, total disk space, and percent use, as Figure 1 shows. It bypasses all directories and files and skips right to the desired information.

BEN WATSON, *via ZD*

PC MAGAZINE: The /V parameter is new DOS 7, and its extended information can quite useful, as Figure 2 shows. The Name, Size, and Modified columns correspond to the first three columns of a regular DIR listing, and the long filename appears the following line. The Allocated column gives the file's size rounded up to the next whole cluster, which is the actual amount disk space that the file uses. The Attrib umn lists each file's attributes. And Accessed column reports when the file last accessed. Of course, the disk space report at the bottom is present as well. If you haven tried the DIR command's /V parameter, give a whirl now.

```
 Volume in drive D is 1600MB-DATA
 Volume Serial Number is 256C-16F6
 Directory of D:\

File not found
                487,587,840 bytes free
              1,622,343,680 bytes total disk space,  69% in use
```

FIGURE 2: *You can use the DIR /V command in DOS 7 to obtain a quick report on used and free disk space.*

```
 Volume in drive C is WINDOWS 3_1
 Volume Serial Number is 1E71-14FF
 Directory of C:\bat
File Name        Size       Allocated      Modified       Accessed  Attrib

.              <DIR>                     11-19-95  7:17a  11-19-95
..             <DIR>                     11-19-95  7:17a  11-19-95
SNAPYO~1 BAT       488           8,192  03-05-96 10:01a  03-05-96
Snap your fingers and cha-cha-cha.bat
CHOPPI~1 BAT       797           8,192  03-05-96 10:05a  03-05-96
Chopping water, carrying wood.bat
       2 file(s)          1,285 bytes
       2 dir(s)          16,384 bytes allocated
                     46,817,280 bytes free
                    133,308,416 bytes total disk space,  64% in use
```

FIGURE 3: *Use the /V switch with DOS 7's DIR command for a verbose listing of file information*

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Ask Our Advisors

HARDWARE

Too Few Floppies

I have a 486-based system with four front-accessible drive bays. Is it possible to install three floppy disk drives—two 3.5-inch and one 5.25-inch—or do I need to purchase an external enclosure? If I can install three, how do I configure them? My system BIOS has places for only two drives. What drive letter would the third floppy get?

JUSTIN GRANT, *Phoenix, Arizona*

PC MAGAZINE: Just as we may never see the "paperless office," it also looks like we won't be seeing "floppyless" computers any time soon. While it's true that most systems are set up for just two floppy disk drives, it is certainly possible to install three or four drives.

The component you need is a controller designed to handle more than two floppy drives. There are a number of manufacturers of such devices, including GSI.

The GSI boards use an on-board BIOS for the floppy connections, so no system memory is used up by software drivers. The company's Model 11 board has two headers, each of which can take a typical two-connector floppy cable. The board's configuration software lets you choose the drive assignments for the attached floppy drives: A, B, "3," and "4." The last two will be given drive letters by DOS during the boot process, and will be assigned letters after all the partitions on all hard disks, but before any drives such as CD-ROM drives that rely on software drivers.

One warning: According to a GSI representative, Windows 95 does not recognize more than two floppy disk drives on the company's boards. If you want to use such a board with Windows 95, be sure to check out the compatibility issues before you buy.—*Alfred Poor*

Beyond BASIC Black

I recently upgraded to an Epson Stylus color ink jet printer, and I want to write QuickBasic code that will print text in color on my new printer. I used the "COLOR x" command followed by LPRINT, but the output only prints in black and white. What do I need to do?

JAMES C. ALLEN, *Aptos, California*

PC MAGAZINE: The problem is that you haven't been sending the color commands to the correct device. The QuickBasic COLOR command affects the screen display, but has no effect on the printer. What you need to do is send specific commands to the printer to tell it which color to use. Most printer commands begin with the Escape character (ASCII 27), which signals the printer to treat the data that follows as a command and not as something to be printed. For this reason, people often refer to printer commands as "Escape sequences."

Different printers use different commands. The Epson Stylus printers use a variation of the Epson 24-pin dot matrix command language, and the Escape sequence for color output is ESCAPE "r"*n* where *n* is one of the following ASCII values:

```
0  Black
1  Magenta
2  Cyan
3  Violet
4  Yellow
5  Orange
6  Green
```

To send this command to your printer, you can use the ASCII code CHR$(27) with the

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LPRINT command. For example, to print a line of green text, you could use the following QuickBasic line:

```
LPRINT CHR$(27) "r" CHR$(6); "This is
a line of green text."
```

You could also use the ASCII value CHR$(114) in place of the "r" in the command line if you prefer.

Other color printers use different command sequences to set the color of the print. For example, PCL color printers have a much more complex system that lets you define custom color palettes. The Escape sequence information may not be included in your printer's manuals; you may need to contact the manufacturer and purchase a technical reference to get all the details for your particular printer.—*Alfred Poor*

Partition Puzzle

My new computer came with its 1.6GB hard disk configured as a single partition, but I want to set it up as multiple 255MB partitions to keep the cluster size small. If I repartition the disk, however, I worry that I will lose all of the preinstalled software. The company from which I bought the system provided Windows 95 and the other software on CD-ROMs, but I don't see how I'll be able to reboot the system from a CD-ROM if I wipe out the operating system when I repartition. Is there any way to boot from a CD-ROM drive?

NORM PETERSON,
Santa Monica, California

PC MAGAZINE: Vendors usually create only a single partition on huge hard disks, probably because there's no profit in creating custom configurations for each individual user. And since the growing user base tends to be less technologically knowledgeable nowadays, support for custom configurations could be a nightmare. The fact is, though, that a single large partition is not an efficient use of disk space, so it makes sense to repartition your hard disk. (For a discussion of why a single, large partition is inefficient, see the May 14, 1996, Solutions column.)

Unfortunately, the simple answer to your question is that you can't boot from a CD-ROM drive. Luckily, it's easy enough to create a floppy disk to take care of the problem—and this is a procedure that all Windows 95 users will want to follow if they haven't already done so.

First, create your boot disk. You'll need a floppy disk with at least a 1.2MB capacity. (Any data that is on the floppy will be erased in this process.) Go to the Windows 95 Control Panel and choose the Add/Remove Programs applet. The third tab on the top of this window reads "Startup Disk"; this will create an emergency boot disk that you can use for your system. Note that you'll need to insert the Windows 95 CD-ROM in your system when you create this disk, so make sure it's handy before you start.

This procedure creates a disk you can use whenever you need to boot your system. All Windows 95 users should have such an emergency start-up disk for each system, and you must remember to create a new one whenever you add new hardware to your system.

> All Windows 95 users should have an emergency start-up disk, and you must remember to create a new one whenever you add new hardware to your system.

Your start-up disk will also contain the FDISK, FORMAT, and SYS utilities you'll need to partition and format your hard disk. Then you'll have to reinstall all of your software (or restore it from a backup, if you've made one).

If you're willing to spend a little money for some peace of mind, the $49.95 PartitionMagic 2.0 utility from PowerQuest (800-379-2566) will repartition your disk nondestructively. With this product, you can shrink existing partitions without harming the data, create new partitions from the space thus freed, and also nondestructively reduce the cluster size of the now-smaller partition. This is a lot less nerve-racking than using FDISK, which destroys the contents of your disk when it changes the partitioning.—*Alfred Poor*

OPERATING ENVIRONMENTS

When Windows 95 Won't Start . . .

Help! Today I tried to change video drivers. I chose what I thought were the correct drivers, restarted Windows 95, and—nothing! I can no longer see the desktop.

I had already set up the machine to boot to the command prompt, but Windows 95 doesn't seem to have a DOS-level setup like Windows 3.1. So I got out the 13 Windows 95 installation disks and reloaded the operating system. Unfortunately, setup didn't change the drivers, even though I was careful to select the known good drivers in the dialog box. Is there anything I can do to restore my original setup?

RICHARD L. TURNER, *via ZD Net*

PC MAGAZINE: Don't worry; there's an easy solution! Restart your system, and when you see "Starting Windows 95..." on the screen, press F8 to get the Windows 95 startup menu. Select Safe mode from this menu. Because you're set up to start at the command prompt, you'll have to enter WIN to start the Windows 95 graphical user interface. In Safe mode, Windows 95 uses a standard VGA driver and the bare minimum of device drivers. Now you can change the video-driver setting from within Windows 95. Safe mode exists to remedy precisely the kind of situation you encountered: a driver problem that prevents you from running Windows 95.
—*Neil J. Rubenking*

Warping Your Pentium for Optimum Performance

I upgraded my system processor from a 486 to a 90-MHz Pentium. It runs faster, but not as much as I'd expected. In particular, when multitasking, it seems as though background tasks don't run much faster than they did before the upgrade. Is there a problem with Warp on Pentiums?

JOHN SMITH, *New York, New York*

PC MAGAZINE: No, there isn't a problem, but you should keep in mind some assumptions that were made in the development of OS/2 Warp. When Warp first came out, the emphasis was that OS/2 could now run reasonably well on lower-end systems, all the way down to 486/25 machines with 4MB of RAM. In order to do that, the default configuration for Warp was one that would provide acceptable performance in that environment.

Now that you have upgraded, however, the default configuration is no longer the best for your needs. We could easily do a feature story on performance tuning, but there are two quick adjustments that should help a lot: In your CONFIG.SYS file, locate the line that says MAXWAIT=3. This line tells OS/2 that a task can wait a maximum of 3 seconds for access to the processor before its priority is raised to make it more likely to gain control. A 486/33 can only do so much in a second, so the parameter is set for 3 seconds, allowing the processor to spend that time doing actual work, not just switching back and forth between tasks.

Your new Pentium/90, however, can do a lot more in each second. As a result, you will likely find that performance is improved by dropping that value to MAXWAIT=1. To demonstrate the results, I created a short REXX program that keeps the processor in a tight floating-point multiplication loop, started a 25MB file copy in the background

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...t the REXX program in the foreground ...Pentium/90 system. With MAXWAIT set ...the file copy took a whopping 15 minutes ...seconds to complete. After changing the ...AXWAIT parameter to 1 (and rebooting the ...tem), the same operation took only 3 min... ...21 seconds.

The second suggestion involves the TIME... ...E parameter. In OS/2 Warp, this parame... ...was removed from the default CONFIG.SYS. ...TIMESLICE line controls the minimum ...unit of time each thread must get before it ...be switched out for another task, and the ...ximum amount of time a thread can get be... ...another thread of the same priority gets ...trol. In Warp, leaving this out means OS/2 ...lowed to adjust the parameter dynamical... ...sed on the job mix. That's probably best in ...ny situations, but it may not be best for ...r particular job mix. In my example (ad... ...tly contrived for extremity), inserting the ...TIMESLICE=33,59 into CONFIG.SYS, re... ...ting, and rerunning the copy/math sce... ...o dropped my copy time to only 1 minute ...seconds.

Your mileage may vary, but you'll find that ...ative tuning can make a big difference in ...stem performance when running OS/2 ...p.—*Brian Proffit*

WORD PROCESSING

Sequential Numbering for Nonconsecutive Paragraphs in Word

Is there any way in Word to number nonconsecutive paragraphs automatically at just one level for the numbering? ...ow you can use heading styles and add num... ...to the headings by using the Format | Head... ...Numbering command, but that method adds ...bering to every level of heading style in the ...ument, not just to the level I want numbered. ...o restarts the numbering for any level below ...ting I whenever you use a higher level. I'm ...ing for a way to add numbers to just one ...—that's not the Heading 1 level—while not ...ring the numbering at any point.

JERRY PUGLIA, *Miami, Florida*

PC MAGAZINE: You're on the right track in ...king about using Heading styles for the ...d of numbering you want. The trick is to ...ize that you don't have to use Heading 1 ...es for first-level headings, or even use ...ading styles for headings at all.

Both Word 6.0 and Word 7.0 let you define ...-heading numbering format for each level ...arately. One of the choices for the number ...mat, none, removes numbers from that ...el entirely. So, one way to get the sequen... ...numbering you want is to redefine Head... ing 2 through Heading 9 to eliminate numbers. You can then use Heading 2 as though it were Heading 1, Heading 3 as though it were Heading 2, and so on, reserving the Heading 1 style for the paragraphs you want sequentially numbered. You'll lose the ability to use Word's built-in Outline feature to organize your document, but for most documents, that shouldn't matter.

To define the number formats, choose Format | Heading Numbering, then choose Modify to open the Modify Heading Numbering dialog box. First, use the choices in the Number Format box to set the format for Level 1, which is the Heading 1 style. Next, go to the Level box just below the Help button in Word 6.0, or below the Cancel button in Word 7.0, and use the slider bar to move to Level 2, which defines the format for the Heading 2 style.

You can now go back to the Number Format box and remove all numbering from Level 2. Set the Bullet Or Number box to {none}, make sure there's nothing in the Text Before or Text After boxes, and check that Include From Previous Level is set to Nothing. Repeat this procedure for all the other levels you plan to use in the document, and choose OK when you're done.

Since Word returns to its default numbering scheme for headings each time you open the Heading Numbering dialog box, you may want to record this entire procedure in a macro. To record the procedure, choose Tools | Macro, enter an appropriate name in the Macro Name text box, choose Record, then OK, and then follow the procedure for removing the numbers from Levels 2 through 9. When you're done, choose Tools | Macro, then Stop Recording, and choose File | Save All to save the changed NORMAL.DOT file with the new macro. You can then run the macro at any time to remove the numbers from Heading 2 through Heading 9 in any document.

Another way to get the same effect is to create a set of alternate heading styles named, say, Head 1 though Head 9. Store these in your NORMAL.DOT template, and you can use the Head 1 through Head 9 styles for headings, use the Heading 1 style for numbered paragraphs, and ignore the Heading 2 through Heading 9 styles entirely. The advantage to this approach is that you won't have to remove the numbering from Heading 2 through Heading 9, since you won't be using those styles.

Note too that with either approach, you can use the Heading 1 style to number any kind of paragraphs you like, not just headings. This can be handy if you number paragraphs the way lawyers sometimes do, with several individual paragraphs making up a single numbered "paragraph." To make this work, you only need to redefine the format for the Heading 1 style so that it matches the format for the rest of your text.

—*M. David Stone*

SPREADSHEETS

Getting Excel To Recognize Dates In a Formula

I have an Excel table that lists transactions by date entered, due date, and amount. Following these three columns are four others labeled Q1, Q2, Q3, and Q4 (see Figure 1). I want to write a formula in each of these columns that will generate either 0 or the value in the amount column, depending on which quarter the due date falls in.

In the Q1 column, I entered:

```
=IF(1/1/96<=B2<=3/31/96,C2,0)
```

This seems as though it should work, but it always gives me 0, even if the date in A2 lies between 1/1/96 and 3/31/96. So I then tried

```
=IF(B2>=35065,IF(B2<=35155,C2,0),0)
```

which works but is a pain in the neck. Do I really need to figure out the serial date values for my quarter boundaries and then write a nested IF formula? Isn't Excel smart enough to do some of this for me?

DAN WRIGHT, *Mukilteo, Washington*

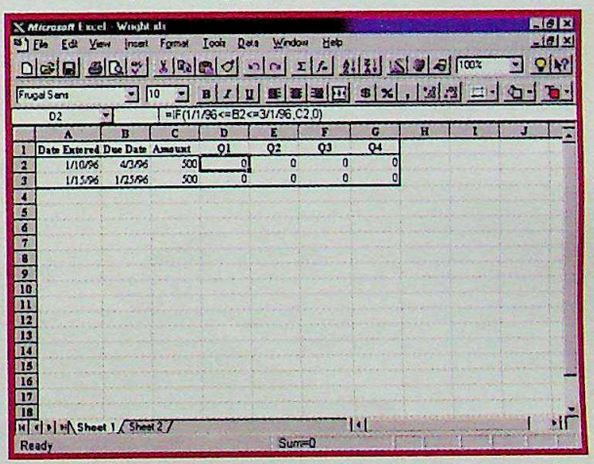


FIGURE 1: *When you put an expression like "1/1/96" in the middle of a formula, Excel can't tell whether you're thinking about the calendar or planning to divide some numbers.*

PC MAGAZINE: Your original formula has two problems. First, Excel needs some help interpreting the date value. If you type 1/1/96 as a

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constant in a cell (that is, if you don't put an equal sign in front of it), Excel knows you're entering a date. Internally, that date is represented by its serial date value, but in the cell, you see it formatted to look like a date (unless you change the format, of course). When you put that same expression in the middle of a formula, however, Excel no longer knows for sure that you're thinking about the calendar. It has to consider the possibility that you really mean to divide 1 by 1, and then divide that result by 96. So, you can't just write =IF(1/1/96<=B2...) if you want to compare B2 with January 1, 1996.

One way to make Excel recognize 1/1/96 as a date is the one you employed in your second formula: Determine the serial date value and use that number instead of the date expression. To avoid the hassle of getting the date value yourself, you can use Excel's DATEVALUE function. The function requires a text argument, so you use it like this:

```
DATEVALUE("1/1/96")
```

If you don't want to clutter up your IF formula with DATEVALUE functions, you can put the quarter boundaries in separate cells and then reference those cells. If you type 1/1/96 in cell A10, for example, then the expression =IF(A10<=B2...) will work fine, even though =IF(1/1/96<=B2...) would not.

That takes care of the first problem. The second problem is that you want Excel to evaluate two conditions: Whether the date is greater than or equal to January 1, and whether it is also less than or equal to March 31. Trying to do that by writing

```
=IF(DATEVALUE("1/1/96")<=B2<=DATEVALUE
Â("3/31/96"),C2,0)
```

is legal, but it won't take you where you want to go. Excel will compare the date value of 1/1/96 with cell B2, and that comparison will return either TRUE or FALSE. Then Excel will compare TRUE or FALSE with the date value of 3/31/96. In Excel's hierarchy of values, TRUE and FALSE are both greater than any number (don't ask why, that's just how it is), so the comparison will always prove false, no matter what's in A2.

One way to make Excel base an IF test on two or more conditions is to use the AND function. AND takes one or more arguments (up to 30 are allowed) and returns TRUE if all arguments evaluate to TRUE. Otherwise it returns FALSE.

```
=IF(AND(DATEVALUE("1/1/96")<=B2,
ÂB2<=DATEVALUE("3/31/96")),C2,0)
```

should do the trick, returning C2 if B2 is a first-quarter date and 0 if not.—*Craig Stinson*

Scientific Misnotation From Excel to Word

Here's a Microsoft Office bug you might want to warn readers about: Microsoft Word 7.0 increases the value of any number entered in scientific notation in an Excel worksheet by one order of magnitude when the Insert File command is used in Word to insert the Excel spreadsheet into the Word document. Microsoft recommends you paste the Excel data via the Clipboard instead of using the Insert File command.

JIM POLISINI, *via the Internet*

PC MAGAZINE: Right you are, it's a genuine bug. The problem appears to lie on Word's side of the transaction. The same operation performed in other OLE containers works fine. I tested to see whether this bug also occurred when you're running Word 6.0 and Excel 5.0, and indeed it does.—*Craig Stinson*

DATABASES

Propagating Name Changes in Microsoft Access

Changing column names in a Microsoft Access database can be a real hassle if you've already created a lot of queries, forms, and reports. Is there an easy way to make bulk changes like this?

MARK ARONSON, *Taos, New Mexico*

PC MAGAZINE: You can use a third-party tool to accomplish this type of global search and replace operation, as I'll explain in a minute. You'll need one, because as you've discovered, Microsoft Access does not as of this writing propagate name changes or assist you in doing so yourself. This means that when you change a column name in a table, you have to manually make that change everywhere in your database—including all forms, reports, queries, macros, and modules that reference the column. To say the least, this can be a tiresome, error-prone process.

Fortunately, a third-party tool called SPEED Ferret (Figure 2) can help. SPEED Ferret lets you globally search for and replace a text string throughout your Access database, including all of the various database objects. You can even rename tables and queries. SPEED Ferret runs within Access as an Add-In accessible from the Tools menu.

Speed Ferret's user interface is simple enough. You supply the string you want to search for and the replacement value. Then you select whether to match only whole words or hits appearing anywhere in the text, and

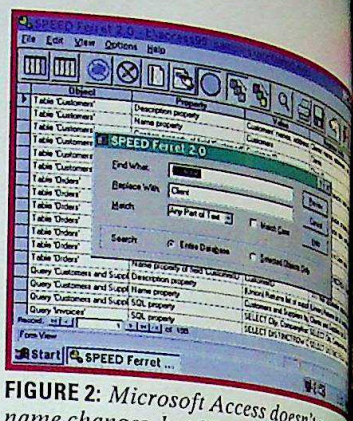


FIGURE 2: *Microsoft Access doesn't propagate name changes, but SPEED Ferret can help. This Access add-in lets you rename database objects and propagate name changes throughout an entire database.*

whether to make the search case-sensitive. You can also choose a pattern match, in which the text must match exactly, letter for letter. Finally you can choose to search the entire database or to restrict the search to selected objects only, based on object type (table, query, module, and so forth), name, creation and modification date.

SPEED Ferret will locate every place where the search item is referenced and present the results in a datasheet Preview window. From there, you can sort and print the search results, edit the replacement values, delete rows so that the replacements do not occur, and otherwise examine the changes to be made. At this point, you'll want to review the changes carefully and make any adjustments. If you choose to save your replacements, SPEED Ferret automatically creates a backup so you can undo your changes later, should you desire.

SPEED Ferret helps automate another tricky and tiresome process. For more information, contact Black Moshannon Systems. Versions are available for both Access 97 and Access 2.0.—*Sal Ricciardi*

Readers are invited to send their queries regarding PC usage to the Editor *PC Magazine India*.

Selected queries will be answered in the PC Solutions department.

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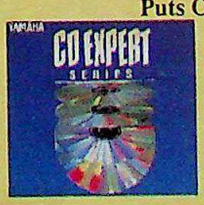
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MARKET

TISL Bags IA Project

Bangalore-based Tata Information Systems (TISL), a joint venture between Tata Industries and IBM Corporation, USA, has bagged a prestigious order from Indian Airlines. Valued at over Rs 500 million, it is the biggest ever IT order in the country involving supply, installation, and support of a new passenger services system (PPS) with reservation and check-in modules for the national airline. The order marks a major breakthrough for IBM's business in India.

The historic contract was signed in New Delhi by Dr Mukesh Aghi, senior VP (marketing & sales), TISL, and T.S. Chandrasekar, director (stores & purchase), Indian Airlines.

The project includes the supply of the latest IBM System/390 computer hardware, and implementation of a country-wide state-of-the-art networking system using PSS software from Speedwing, a British Airways subsidiary. Speedwing is also an IBM business partner. TISL is the prime contractor for the entire project.

The salient features of this solution include an array of functionalities in reservation and check-in systems; a highly reliable banking system with 99% availability; a complimentary metal oxide semiconductor (CMOS) technology system/390 processor with easy upgradeability and open architecture; high-speed links between major cities with alternate routing to ensure traffic sharing; efficient services to travel agents; and superior load planning for aircraft.

The solution will help Indian Airlines provide better customer services like on-line check-in.

IBM and its partner, Speedwing will execute the project in one year's time. The two companies have jointly worked on many similar projects worldwide.

TISL markets and supports the entire range of IBM products and services in India. It is a complete solutions vendor having expertise in areas including hardware, application software, networking, maintenance, and training. The company's turnover in 1995-96 was Rs 3,400 million. Indian Airlines is the largest domestic airline in the country, handling over 9 million passengers annually.

Intel Announces Adaptive Technology

US-based Intel Corporation, the world's biggest manufacturer of processor chips, has introduced Adaptive Technology, a Fast Ethernet breakthrough that allows customers to upgrade a network adapter's microcode, and to optimize it for ever-changing network operating environments. The new capability increases the performance and flexibility of PC networks, while reducing the overall cost of business computing.



With the help of Adaptive Technology, a software update can modify the silicon on model B versions of the PCI Intel EtherExpress PRO/100 adapter, without requiring the customer to touch the adapter hardware.

Intel's Adaptive Technology enables customers to take advantage of the latest Intel architectural advancements and performance technology as part of a long-term strategy for Fast Ethernet workgroups. Long-term capabilities for Adaptive Technology could include enabling the silicon to behave differently, depending upon network traffic, network collisions, the network protocol loaded, and other network changes.

The foundation for Adaptive Technology is the Intel 82557 Fast Ethernet controller included on model B versions of the PCI EtherExpress PRO/100 adapter. The controller enables the reloadable microcode updates that equip the adapter for new capabilities including optimized performance.

The entire family of Intel's Fast Ethernet adapters runs at both 10 Mbps and 100 Mbps, allowing users to install the cards today and, if needed, operate first at 10 Mbps, and seamlessly migrate to 100 Mbps when ready. Adaptive Technology extends that upgrade path by providing new capabilities without high port and service costs.

Adaptec to Acquire Cog

US-based Adaptec, a leading pr of I/O, network, and connectivity ponents to peripheral manufa has agreed to acquire Washington Cogent Data Technologies in a $ lion stock transaction. Cogent, a p ly-held company founded in 198 vides high-performance Fast Et products for the networking marke

"We are in the business of g bandwidth management. Our strat to provide hardware and software ucts that enable network servers and performance desktops to rapidly information. Fast Ethernet is an ex opportunity to expand the netwo side of Adaptec's bandwidth ma ment," says Grant Saviers, preside CEO, Adaptec.

Clay Marr, VP and GM (networ ucts business unit), Adaptec, chara ized the acquisition as a "Move that perfect sense for both companies. W adding Adaptec's financial and ma ing strength to Cogent's complete Fast Ethernet products. Cogent's pr tive pipelining software technolog enabled it to win many best-of- awards for server throughput. Our is server-centric, and Fast Ethernet nology is being rapidly adopted in area."

Dr Charles Anderson, founder president, Cogent, concurred, "The bination of Cogent's technological e tise in Fast Ethernet and the stren Adaptec in the I/O marketplace will the companies to assume a strong po in the high-performance Lan arena. companies share a server-centric pr and market focus. This vision shou us a significant market opportun high-performance I/O server compo for file, video, Internet, and intranet cations."

The acquisition will be accounte under the pooling method of accou Accordingly, Adaptec will record the quired assets and assumed liabilities their book values as on the acqui date. The acquisition of Cogent will Adaptec a distinct edge. Adaptec pro are distributed in India by Bang based Spectra Innovations.

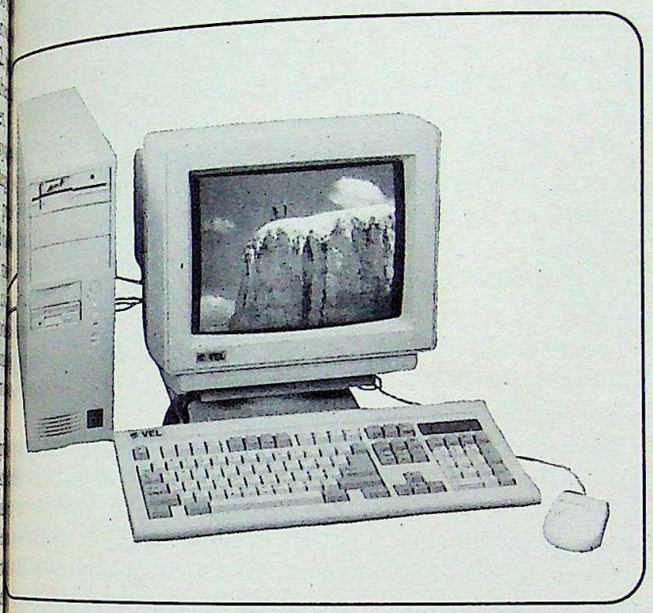
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Microsoft Unveils Internet Strategy

New Delhi-based Microsoft India has announced what it believes is the industry's most comprehensive and compelling Internet strategy. The company will support and enhance the Internet by integrating the PC platform with the rapidly emerging public network. Microsoft offerings take into account every key element of the Internet—from the server and client platforms to the tools, applications and on-line services, and game and information content.

The Internet, hailed as the most important technology development since the introduction of the IBM PC in the late 1970s, will soon become all-pervasive. Microsoft will lead the way into the next stage, where access to the Internet is simply a common element of all computing, as well as provide web developers and producers all tools needed to create the content for the users.


Meena Ganesh.

Speaking on the occasion of Internet Day in India, Rajiv Nair, MD, Microsoft India, said, "The Internet provides an amazing opportunity to acquire information, conduct business, communicate with others, and deliver new forms of entertainment. The opportunities presented by the Internet permeate the thinking of all our product planning and product development efforts." Quoting Bill Gates from an earlier meeting in Redmond, Nair added, "Our focus on the Internet is critical to every part of our business. I assign the Internet the highest level of priority."

Microsoft is taking a long-term approach to the Internet.

To optimize the offer of Internet, Microsoft has focused its efforts on both its platforms and application products. "We see our role as providing unity between the PC and the Internet, so customers can leverage their existing investments in PC's and take advantage of the new investments in the Internet," said Meena Ganesh, practice manager (Microsoft consulting services), Microsoft India.

Microsoft will integrate the Internet and the desktop PC into a unified, consistent experience for users, and for those developing solutions. The focus is on Windows and efforts are on to evolve it into the best platform for browsing information. In future versions, browsing will occur independent of the location, be it the hard disk, the network, or the Internet. The Windows Internet platform will unify Web pages and Office files, allow users to edit documents and spreadsheets over the Internet, and simplify connectivity to the Internet by just a single mouse click.

The current version of Microsoft's Internet Explorer 2.0 for Windows 3.1, Windows for Workgroups, Windows 95, Windows NT, and Macintosh are already available in the market. The next version, Internet Explorer 3.0, which is in test phase at present, will be launched in the next quarter.

Recognizing the increased use of Internet technologies by the business community to integrate their business applications with the Internet and corporate intranets, Microsoft has equipped the Windows NT Server with the Internet Information Server (IIS). The Internet Information Server is designed to be fast, secure, and reliable, and helps companies to create Web sites and publish information for their internal use as well as for sharing with the external world. The Internet Server API, which has been developed to be an open standard, ensures that existing business applications can be linked to the applications that would be running on the intranets.

One of the challenges faced by Web developers and Web site producers is to create content, which is dynamic and active. ActiveX is the umbrella for the Microsoft tools and APIs that enable developers to create interactive content for both the personal computer and the Internet.

Envisaging a seamless environment where users can move from local computers to the Lan, the Wan, and the Internet, all Office applications have been extended to provide this functionality. For instance, Internet Assistant allows users to read and write HTML (hypertext markup language) files and Web documents from within Office applications such as Word and Excel. Front Page helps users author and publish documents individually or in collaborative effort, for the Web. Developers can incorporate Viewers in Web server or client software, enabling users to view and print on their computers, Office-based files even without the full applications.

Microsoft has adopted and embraced key Internet standards such as TCP (transmission control protocol/Internet protocol), HTML , and HTTP (hypertext transfer protocol). These standards have been integrated into Windows to maintain usability and access for the end-user, while developers and content providers can expand current systems to take advantage of the enormous opportunities the Internet offers.

HP Sales, Marketing Undergo Restructuring

Hewlett-Packard Company has decided to reorganize its sales and marketing divisions to focus on the three major customer segments of retail consumers, commercial resellers, and enterprise accounts. The company's worldwide sales forces will represent products and services spanning HP's computer-related portfolio, and will be structured and managed to ensure close alignment with the respective market segments, channels and product lines.

While the consumer sales and marketing organization will develop and implement a retail program targeting individuals, small businesses, and small office customers, the commercial channel sales force will manage relationships with value-added and high-volume reseller channels to serve small, medium, and large business customers worldwide. The enterprise sales force will focus on HP's biggest enterprise customers and crucial products like the 9000 Unix system workstations and servers, HP OpenView/OpenMail, and the 3000 family of systems.

The sales forces will report to the primary business groups as well as the new centralized computer sales and marketing organization. The new system is being implemented and, according to company officials, all required changes will be completed by November 1, 1996.

Also read *HP Expands Ties with Intel and HP Joins Virtual Corporation Tie-Ups.*

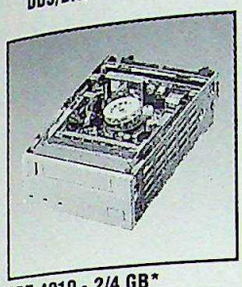
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Enhance your efficiency - Not your budget

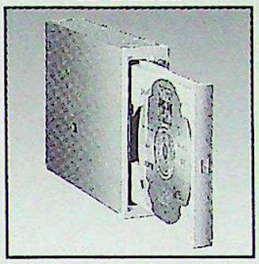
SONY

DDS/DAT TAPE DRIVE



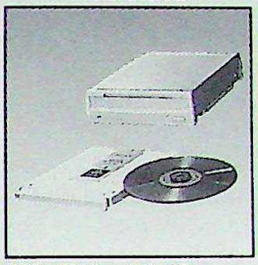
SDT 4010 - 2/4 GB*
SDT 5010 - 4/8 GB*
SDT 5210 - 4 GB
SDT 7010 - 8 GB

CD-ROM DRIVE / CD-WRITER



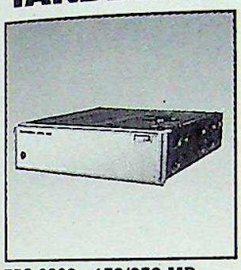
CDU 311 - 8X CD ROM (IDE)
CDU 76S - 4X CD ROM (SCSI)
CSP - 9411S - 2X WRITE & 4X READ

MAGNETO OPTICAL DISK DRIVE



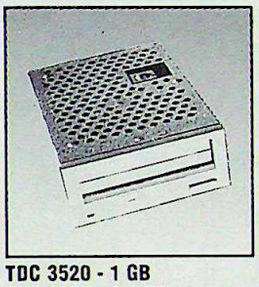
SMO F541 - 2.6 GB WITH EFFECTIVE ACCESS TIME 9.6 mSec

TANDBERG DATA



TDC 3660 - 150/250 MB
TDC 3820 - 525 MB
TDC 4120 - 1.2 GB
TDC 4220 - 2.5 GB
TDC 4222 - 5 GB*
TDC 6122 - 13/26 GB*

*Using Data Compression

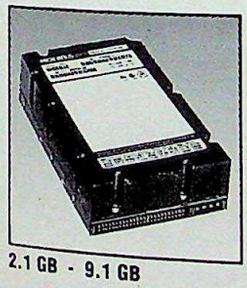


TDC 3520 - 1 GB
TDC 3720 - 2.3 GB

Designed for Microsoft Windows 95 · Microsoft Windows Compatible · yes It runs with NetWare · yes UnixWare · Solaris Compatible · Available and Ready for OS/2 · SCO OK

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DATTARAM

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IBM, Lotus Provide Integrated Solution

Making network and Internet/intranet computing easier for customers and resellers worldwide, IBM Corporation and its subsidiary Lotus Development Corporation have announced the availability of a total hardware and software solution—the combination of Lotus Notes Release 4 Server with all PC Servers at no extra charge.

Lotus Notes Release 4 single-processor Server edition licence will be available worldwide for a limited time at no extra charge, with all PC servers. Customers purchasing PC servers will receive one license of Notes Release 4 single-processor Server, along with documentation, which includes a guide and the Notes Release 4 install guide for servers. An upgrade to the Notes multi-processor Server edition can be purchased from Lotus business partners for use on systems with multiple processors. This offer is available from IBM and Lotus Business Partners.

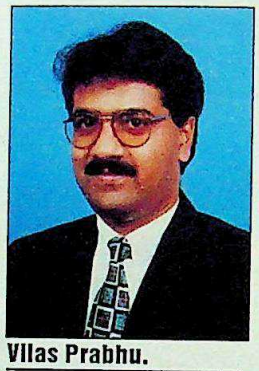
"The Notes bundle adds value to our IBM PC servers by providing a rich environment for developing, managing, and hosting collaborative, interactive business applications on and off the Web," says Michael Coleman, GM, IBM PC servers. "Together, IBM PC servers and Lotus Notes provide customers with a powerful combination of hardware and software—a single client/server messaging and groupware solution that integrates easily with the Internet."

Lotus Notes provides an ideal communications infrastructure by combining enterprise-ready, client/server messaging, and the global access and distribution of the World Wide Web, together with a platform for rapidly developing and deploying strategic groupware applications. Notes enables individuals and organizations to communicate with colleagues, collaborate in teams, and coordinate business processes within and beyond their organizational boundaries to achieve improved business results. Lotus Notes supports all major operating systems including IBM OS/2 Warp, Apple Mac OS, Unix platforms including IBM AIX, Sun Solaris, HP-UX, and Microsoft Windows and Windows NT. Notes is also available as a NetWare loadable module for the Novell environment.

Lotus now markets its products in more than 80 countries worldwide, and provides professional consulting, support, and education services through the Lotus services group.

Cable Giant Sets Up Shop in India

Scotland-based BICC Brand Rex, a leading supplier of data communication cable systems, has set up a sales office in Mumbai to cater to the Indian market. The Band Rex range will be marketed under the brandname Millenium.


Vilas Prabhu.

Says Vilas Prabhu, country sales manager (India), BICC Brand Rex, "Growth of datacom cabling systems in India is running at around 150% per annum currently, and initially, we will concentrate on India's 16 metropolitan cities. There is a great potential for our new Millenium system throughout India."

The new sales office in Mumbai is currently establishing a nationwide network of distributors and installers for the Millenium range, which offers a mix of optical fiber and copper cabling. The range includes CAT5Plus, Blolite, Blotwist, MTConnect, and Helios.

Brand Rex was acquired by BICC Cables and merged with the latter's datacom and defense division. Recently, the company expanded its UK-based manufacturing facilities to come to grips with the increasing international demand for its cabling products.

Unicorp Launches 200 MHz Pentium PC

Unicorp Industries, a leading Indian PC vendor, has launched PowerPro PC, a high-end PC based on a 200 MHz Pentium processor. The launch is part of Intel Corporation's simultaneous launch of the processor worldwide. Currently, the two companies are working together to promote the 'Intel Inside' programme in the country. The Intel 200 MHz processor will provide a significant boost to the performance of critical applications

Says Arun Sogani, MD, Unicorp dustries, "The PowerPro systems are rently being marketed through the ny's nationwide dealer network. W launch of the 200 MHz CPU PowerPro will be targeted at cor customers." Unicorp is currently sh over 800 systems per month from its ity in Delhi. The company's new Gurgaon, which will start function the year end, will enhance the capa over 3,000 systems per month. U has registered an impressive growth the years showing a tremendous inc in profits.

The company has alliances with nationally known companies. The clude Compaq, for an entire ra computer systems. The company's cialized division, Uni-Net, offers net ing solutions incorporating hig internetworking products. Structur bling systems from AT&T and V from Hughes Escorts are the other products that Unicorp offers.

Unicorp Industries has also e into an alliance with Sequent Co Systems of USA for high-end appli servers, which find use in large da environments in industry sectors l nance, process, telecom, and manuf ing. Unicorp was recently appointe thorized distributor of Apple prod India.

Orient Bags Consultancy Contract

Mumbai-based Orient Inform Technology, a services-oriented pany specializing in consultancy banking systems, has bagged a lu contract for enhancing, develop stalling, and implementing a retail ing software system for Emirates International, the leading network o in Dubai. The software system run IBM mainframe to support extende tomer facilities.

Orient has also been retained vide a share management solution bank network. The contract includes ware upgrading and customizatio better efficiency, automation, and facing with the bank's mainframe s

Orient is likely to get more such tracts in the Middle East.

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TIE-UPS

Hexaware to Sell Novell Products

Mumbai-based Onward Novell Software India, a joint venture between Novell of the US and Onward Technologies, has appointed Hexaware Infosystems as its authorized national reseller of the Novell range of products. The appointment will enable Hexaware to sell and support Novell products directly and through its channel partners.

Says Nandu Pradhan, VP, Onward Novell Software India, "We are increasingly focussed on servicing all purchase and support needs of our business partners. With its marketing and technical strength, Hexaware Infosystems is a very important channel partner for us. It is with the support of our channel partners that NetWare has become the networking language of corporate India."

Satyen H. Parikh, associate VP, Onward Novell Software India, adds, "Hexaware currently has 85 dealers. With



Satyen H. Parikh and Mohan Kargaonkar sign the distribution agreement.

this agreement, we have strengthened our customer reach, resulting in easy availability of Novell products for our customers."

Ganesh Natarajan, chief executive, Hexaware Infosystems, comments, "We choose Novell since it is the leading networking company in the world, and has a dominant presence in India. With Novell added to our present range of SCO, Oracle and PowerBuilder, Hexaware will become a complete provider of client/server solutions in the country."

According to Mohan Korgaonkar, senior VP, Hexaware Infosystems, "Novell NetWare being the preferred choice of Oracle Workgroup 2000 customers, adding NetWare to our product line is an obvious and very logical step for us."

Hexaware Infosystems, a wholly-owned subsidiary of Apple Industries, is involved in software development for exports. It specializes in client/server solutions for small, medium, and large corporations. The company also distributes the product ranges of Powersoft, Logic Works, SCO, and Oracle.

Videoconferencing System from PowerTel Boca

PowerTel Boca has announced that it plans to expand its video products family with the addition of a dial-up desktop videoconferencing product in India.

Boca's desktop videoconferencing product provides face-to-face desktop videoconferencing with simultaneous audio/video over a single dial-up telephone connection. This product is a collaborative effort and incorporates a combination of technology designs. Boca research has designed the hardware and PCI bus adapter. MultiMedia Access Corporation has provided the application software and, Microelectronics group of Lucent Technologies has provided the audio/video processor (AVP) chip.

The product has been designed to work with the entire range of Boca Research's V.34 modems. It is an excellent bundle for OEMs, and a great add-on package for Pentium PCs.

On-board hardware provides real-time compression and decompression of audio and video signals, giving unsurpassed teleconferencing capabilities. It supports a high-quality connection to the desktop via the H.324 (POTS), H.320 (ISDN), and H.323 (Lan) industry standards. With its five external connectors for NTSC/PAL camera input, microphone input, microphone output, line in, and line out, it is a complete desktop videoconferencing solution.

Says Steve Mills, VP (business development), Boca Research. "Businesses can save travel using our desktop videoconferencing system for one-on-one video telephone calls, and grandparents can now talk to and see their grandchildren from their PCs."

"The Boca Video Phone is especially relevant for India, given the continental geography of our market," adds Dinesh Puri, MD, PowerTel Boca.



Dinesh Puri.

PowerTel Boca is a joint venture between PowerTel and Boca Research, the leading US manufacturer of data communications, multimedia, network access, and video products. The company offers the industry's widest range of PC enhancement products.

Finesoft Is Centura Reseller

Bombay-based Akshay Software Technologies (ASTL) has appointed Finesoft Technologies of Bangalore, as the authorized reseller for Centura (formerly Gupta) products in South India.

By virtue of this agreement, Finesoft will act as a non-exclusive client/server reseller for ASTL in Karnataka, Kerala, and Tamil Nadu, enabling ASTL to strengthen its position in the south.

Finesoft has been one of ASTL's key partners in South India. The company specializes exclusively in the Centura range of client/server products for Centura users worldwide. ASTL and Finesoft will jointly organise events like road shows, technical seminars, and exhibitions.

Says C.V. Anant, MD, ASTL, "It is a great pleasure for us to be working with Finesoft, who have a long association with Gupta and Gupta products."

K. Mutthuswamy, MD, Finesoft, adds, "Finesoft is proud to be a virtual arm of ASTL in making Gupta technology number one in the Indian IT industry."

ASTL is a leading information management and consultancy organization with focus on client/server and 4GL technology. ASTL provides services such as turnkey systems development, product development, re-engineering, off-site, offshore, and on-site development, and setting up offshore development facilities. As part of its consolidation process, the company has set up offices in Bombay, Madras, USA, and UAE. ASTL is the sole distributor for Centura products in India.

Finesoft's focus areas are consultancy, technical support, applications, and so on.

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HP Expands Ties with Baan

New Delhi-based Hewlett-Packard India has teamed up with Baan India of Bangalore, to optimize the latter's Baan IV BackOffice enterprise business application software for NT enterprises. The two companies will jointly optimize Baan IV BackOffice running Microsoft SQL Server and Windows NT on HP's Pentium Pro-based HP Net Server LX.

Says Duncan Campbell, worldwide marketing manager (network server division), HP, "Our company is expanding its long-standing relationship with Baan in the Unix systems market to deliver solutions for the NT market. Together, we intend to deliver unparalleled levels of manageability, availability, and performance for our joint Baan/HP-NT enterprise customers."

Nearly half of Baan's customers rely on HP for their hardware requirements. Now, Baan and HP will offer their customers solutions in an integrated Unix/NT environment.

"With this expanded alliance, we are offering an optimized Baan solution on HP Net Server products. The solution gives customers in manufacturing and vertical markets a viable solution for the NT enterprise market. Baan's capacity for enabling customers to dynamically model their applications through a changing business environment, coupled with HP's platforms for reliable NT computing, will, we believe, offer the first cost-effective solution for large, medium, and small enterprises," adds Doug Sallen, VP (corporate marketing), Baan.

HP's recently announced Pentium Pro-based Net Server LX Pro application server is designed to meet the performance and availability needs of demanding business-critical applications, including Baan IV. Its advanced features maximize system uptime, and its memory and storage capacity enables it to grow as customer needs grow.

HP has also outlined its clustering roadmap, which includes porting HP's proven MC/Service Guard to the NT platform, thereby delivering a robust solution that helps ensure maximum uptime for critical applications.

The Baan Company is a leading provider of enterprise-wide business software applications and consulting services. Companies in the hybrid manufacturing, as well as automotive, electronics, project management, and process industries use its products to streamline processes across the enterprise, as well as external processes across the supply chain. The company offers the Baan family of integrated, open systems-based applications and tools developed for the client/server architecture.

Nokia to Provide GSM Networks

Nokia, a Finnish telecom giant, has announced the consolidation of its presence in India with a total of five circles and two metros in which it has signed cellular telephony contracts for turnkey GSM networks, or for the supply of equipment and services.

In addition to providing GSM equipment to Modi Telstra in Calcutta, and to Skycell in Madras, Nokia has signed contracts to supply GSM networks to Fascel in Gujarat, Tata Communications in Andhra Pradesh, and BPL US West in Tamil Nadu. In addition, Nokia will supply mobile switching centers to BPL US West in Maharashtra and Kerala.

Hannu Karavirta, MD, Nokia Telecommunications, says, "I am happy to highlight Nokia's growing presence in the Indian cellular telephony market. Nokia Telecommunications supplied equipment for the very first GSM cellular service in India which Modi Telstra launched in Calcutta last year. Now, in a short span of less than a year, we have seven contracts. We have grown to nine offices and employ a hundred and fifty trained and highly skilled personnel. We are confident that cellular telephony will expand phenomenally in India. On its part, Nokia is committed to supplying the latest equipment, services, and turnkey solutions, along with the best cellphones in the market."

Mr Karavirta adds, "Nokia Telecommunication's customer service center in India will carry out all installation, testing, commissioning, and support services. Supplies have already begun and we expect to execute all the projects on time or ahead of schedule. As part of its after-sales service, Nokia will provide training, long-term technical and software support, and 24 -hour help-desk services."

Nokia is a Finnland-based telecommunications group with net sales of US $ 8.4 billion in 1996. (Also read *Nokia Launches Cellphone* under In Brief).

Digital to Offer SSA Solutions

Bangalore-based Digital India, a ly-owned subsidiary of Digital E ment Corporation of the US, has a strategic agreement with Syste ware Associates (SSA), to make ter's enterprise resource planning solutions available to Indian custo

Under the terms of the agree SSA India will provide marketi hotline services as well consulta sources to support Digital in selli implementing SSA's client/server ness planning and control system to end-user organizations. Digita function as the distributor of SSA's client/server product line, and pr technology, consultancy, and syste tegration services.

Thus, customers in India will to get complete ERP solutions for facturing, including supply chain, bution, financial, and electronic com from a single source. Digital will p all the components including com platform, networks, application so and implementation services. Digi also use its systems integration exp and SSA's implementation method to provide a faster return on invest through greatly reduced and predi implementation cycles.

Says Som Mittal, MD, Digital "The manufacturing industry is one key focus areas, and this agreement a long way in endorsing Digital's com ment towards addressing this all-i tant segment. We have an estab presence and a large installed base manufacturing industry. By teami with SSA, a leading ERP vendor, D will provide its customers better pro and services.

Narayan Shekar, country develop manager, SSA India, adds, "By co partnership with Digital, SSA will jump start to penetrate the open sy market in India. Digital's experien implementing ERP makes BPCS server on 64-bit Digital Alpha ser best-of-breed ERP platform. Together Digital, we now bring that world expertise and experience into the server market in India." Digital which was not doing so well till appears to have broken fresh ground the help of a number of crucial ri

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COMPETITIVE

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Pentium 90 MHZ CPU 256 KB Cache exp to 1024 KB 32 Bit 8 MB Memory exp to 128 MB True PCI Bus PCI VGA High Performance graphic accelator card with 1 MB RAM PCI enhanced 4 IDE HDD Controller Highspeed, @SP/ECP/EPP/GP Imported Minitower Cabinet & SMPS SVGA 1024 x 768 S/W Monitor Mouse, 101 Compaq Key Board	Pentium 60 MHZ CPU 256 KB Cache exp to 1024 KB 32 Bit 8 MB Memory exp to 128 MB True PCI Bus PCI VGA High Performance graphic accelator card with 1 MB RAM PCI enhanced 4 IDE HDD Controller Highspeed, 2SP/ECP/EPP/GP Imported Minitower Cabinet & SMPS SVGA 1024 x 766 S/W Monitor Mouse, 101 Compeq Key Board	486 Dx4 - 100 MHZ CPU 256 KB Cache exp to 512 KB 32 Bit 4 MB Memory exp to 128 MB True PCI Bus PCI VGA High Performance graphic accelator card with 1 MB RAM PCI enhanced 4 IDE HDD Controller Highspeed, 2SP/ECP/EPP/GP Imported Minitower Cabinet & SMPS SVGA 1024 x 768 S/W Monitor Mouse, 101 Compaq Key Board	486 Dx2-66 MHZ CPU 128 KB Cache exp to 512 KB 32 Bit 4 MB Memory exp to 128 MB True Vesa Buss VGA High Performance graphic accelator card with 512 KB RAM Vesa enhanced 4 IDE HDD Controller Highspeed, 2SP/ECP/EPP/GP Imported Minitower Cabinet & SMPS SVGA 1024 x 768 S/W Monitor Mouse, 101 Compaq Key Board	386 Sx-33 CPU 4 ISA expansion slots 512 KB VGA Card 2S, IP, & Game Port 1.44 MB FDD Imported Minitower Cabinet & SMPS SVGA 1024 x 768 S/W Monitor 101 Compaq Key Board
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Tandem in Tie-Up with IOS

Tandem Computers has entered into a marketing alliance with Intelligent Object Solutions (IOS) of the US. The two companies will market to wireless service providers, software that prevents fraudulent access to their services. Tandem and IOS will also jointly develop, market, and support additional vertical wireless applications.

Under the terms of the agreement, IOS will develop cellular fraud-prevention and detection services on Tandem's Himalaya intelligent network server (INS) platform for deployment in IS-41-based wireless networks. In addition, IOS will market Tandem applications such as home location register (HLR), personal dialing service (PDS), message waiting indicator (MWI), and authentication center (AC) as part of its integrated service bureau solution set for cellular service providers.

The IOS Intelligent PIN+ application, which operates with INS software on Tandem's Himalaya parallel computing platform, detects fradulent activity and prevents fradulent calls from being completed. By establishing and maintaining calling profiles of subscribers, out-of-profile call requests can be identified in real-time, so that personal identification numbers (PINs) can be requested to ensure that only legitimate calls are allowed to be placed.

"With this system, unauthorized calls and lost revenues resulting from phone cloning or other illegal means can be significantly reduced," says Burce Hill, VP (telecommunications marketing group), Tandem.

As a customer convenience, the Intelligent PIN+ service minimizes the need for subscribers to enter a PIN for each call placed. Roughly 90% of the cellular calls placed are within profile, and therefore, do not require routine PIN use. IOS Intelligent PIN+ service will help carriers save millions of dollars through reductions in fraud.

Managing a caller's use of PINs can reduce the likelihood of fraud by more than 75%. A pattern of unauthorized calls can be spotted and action taken immediately. In addition, the Intelligent PIN+ service provides significant savings in network capacity compared with current techniques, because the PIN will only be required for out-of-profile calls. Estimates by some carriers place the savings at as much as 4.5% of total air time capacity.

IOS is a telecommunications solutions provider with offices in the US and Canada. The company provides a wide range of intelligent network-based services, fraud prevention and detection products, and consulting services tailored to the needs of individual customers.

Tandem Computers is a US $ 2.3 million company that designs and delivers technology solutions. It has offices, strategic partners, and solution providers in more than 50 countries around the world.

Corel Product to Offer Java Content for Oracle NC

Canada-based Corel Corporation, a provider of graphics and multimedia software, has announced that its Corel Barista publishing technology will allow users to create Java-based content for the network computer (NC) announced by Oracle Corporation. NC is Oracle's implementation of low-cost computing devices based on Internet standards.

Corel Barista will allow users of Corel Office Professional's WordPerfect 7 and Corel Ventura 7 to create documents based entirely on Java, without any programming requirements. These Java pages give the publishers complete control over the final look and feel of the documents, and will contain unique interactivity and multimedia capabilities. Because Corel Barista pages are delivered through Java, they are portable across platforms and compatible with any Java-enabled browser.

Corel also announced its intention to create a Java-based suite of integrated productivity applications. The new office suite will leverage the advantages of the Java platform and offer cross-platform functionality based on component architecture that is delivered on-line.

Cisco Products for Digex Net Services

Products of US-based Cisco Systems, the world's largest supplier of internetworking solutions, have been selected by Digex, a well-known Internet service provider (ISP) in the US, for its commercial Internet services. The Digex Telecommute Services group pro... subscriber line Internet acces... telecommuters and small office ho... fice (SOHO) customers featuring ... reliability and extensive customer ... port. While Cisco AS5200 access ... has been recommended by Digex ... subscriber base as the dial-up platfor... accessing Digex services, Cisco 751... router has been chosen for the ISV'... tional backbone network. Other pro... selected by Digex include Cisco ... an asynchronous router for remote ac...

HP Joins Virtual Corporation

New Delhi-based Pertech Comp... (PCL) is back in the news, thanks ... crucial business tie-up with New D... based Hewlett-Packard India, a ... owned subsidiary of Hewlett-Pac... Company of the US. The tie-up mark... entry of HP into 'Virtual Corpora... PCL's alternative to the joint venture ... mula.



Dadan Bhai & Suresh Rajpal announcing ... tie-up.

PCL and its Virtual Corporation ... fered a major set back in the recent ... when Dell appointed two new distribu... for the Indian market, and all but ab... doned the Virtual Corporation. HP's ... into the fold will compensate for the l... enhancing the prestige and prospects ... both PCL and the Virtual Corporation.

Says Dadan Bhai, chairman, PC... "With HP, we are bringing in the wor... most admired fortune 500 company ... partner in this effort." Suresh Raj... president, HP India, adds, "This ti... will increase HP's ability to serve cus... ers for computer products in the coun...

Virtual Corporation was launched ... December 1994 by PCL, Motorola, ... Novell, Dell, and SCO. The group ... expanded to include 3Com. The latest ... up makes HP a member of this alliance.

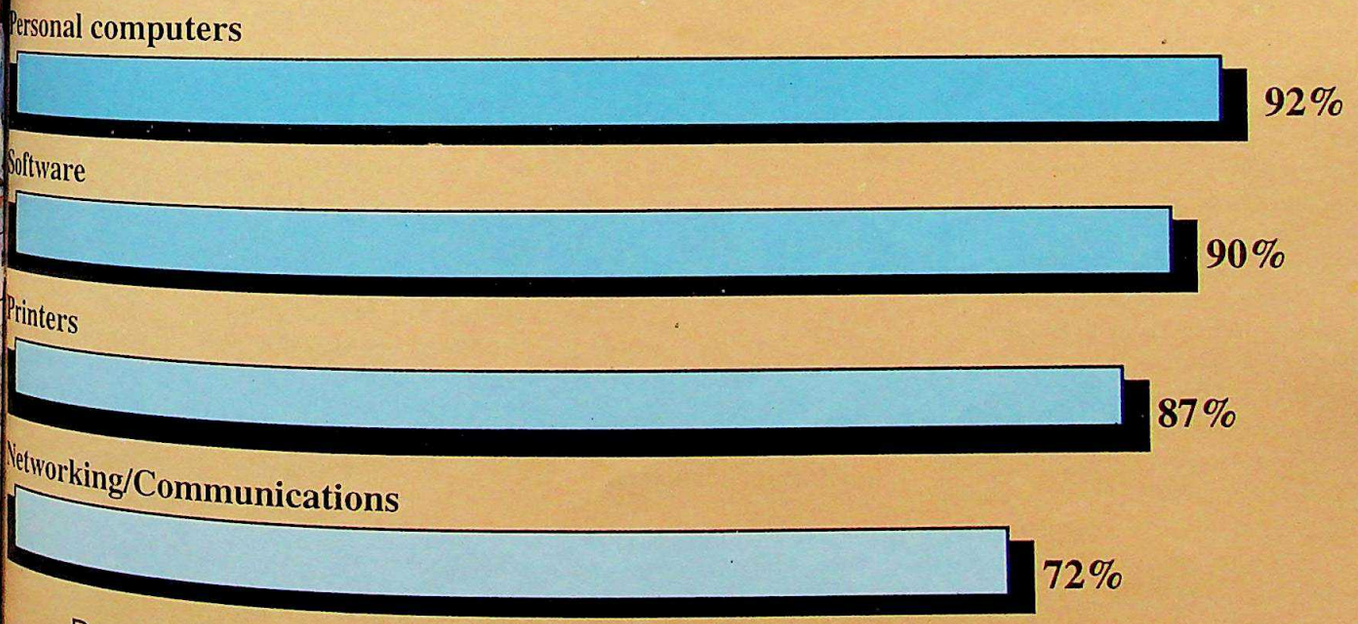
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IN BRIEF

Mindware Announces Product Range

Bangalore-based Mindware, the software exports division of PCL, has announced a range of products aimed primarily at the international market. These products were unveiled at the recently concluded Computer Faire & Bexa, the premier IT event of South Africa.

Medinet, the company's flagship product, is a comprehensive hospital management system. Medinet's modular and open architecture enables it to address the needs of a broad range of hospitals and clinics. The application runs on any ANSI SQL-complaint database on Unix, Windows NT or NetWare, and Windows front-end. All the major functions of a hospital are addressed in an integrated environment to improve service quality and productivity through information flow across departments.

Also previewed at the fair was Neura, an advanced business intelligence software. Neura integrates information from heterogeneous databases into a data warehouse optimized for decision-support. End-users can explore data along business dimensions and create dynamic models for trend analysis, variance reports, and monitoring exceptions. The 32-bit application on Windows 95 is ideal for decision-makers who want to access enterprise-wide information and perform sophisticated analysis without having to learn complex SQL-based tools.

With its global operations in software development and consultancy, Mindware provides its clients with state-of-the-art technology solutions from a business perspective. It has created specialized technology domains to provide focussed services to its clients.

Nokia Launches Cellphone

Nokia Mobile Phones, a division of Nokia, has launched its latest model, Nokia 1610, in India. The model won the prestigious Callnet Caesar award for 'innovation'. The mobile phone set has been hailed for its simplicity of design and robust performance. It has an impressive talk-time capacity of up to 7 hours, and a formidable stand-by time of up to 200 hours.

Nokia 1610 is packed with features that make it a very popular cellphone in the mid-price segment. It incorporates the Nokia menu system, logical keypad layout, and the characteristic large LCD display. In addition, it has a dedicated voice mail key and incorporates one-touch dialling. The phone also supports a short message service.

Nokia Mobile Phones simultaneously announced the launch of the Nokia 'Helpline', designed to guide existing and prospective Nokia cellphone users on various aspects like phone usage, features, prices, accessories, service, and so on. 'Helpline' will also provide basic information on cellular phone services. This pioneering initiative supplements Nokia Mobile Phones' ongoing educational efforts through mass-media and live demonstrations in the Metro cities.

Nokia Mobile Phones is Europe's largest and the world's second-largest manufacturer of mobile phones, and a world leader in digital cellular technology. The company is part of Nokia, the global telecommunications and electronics group headquartered in Helsinki.

Structured Cabling Systems from Molex

Bangalore-based Molex India, a subsidiary of Molex of the US, which specializes in the manufacture of electronic and fiber optic connectors, has introduced the Mod-Tap range of structured cabling systems in the country. The range includes System 100 for high-speed Lans required by multimedia and Internet applications, and Lan Cabling Kit for the SOHO segment.

Mod-Tap systems will be manufactured at the company's Rs 60 million facility in Bangalore, which boasts ISO 9002 certification from Standards Australia.

Mod-Tap, a leading manufacturer of structured cabling systems, was taken over by Molex in early 1995. The company has set the target of cornering 10% of the roughly Rs 800 million cabling systems market in the country by the end of the first year.

While New Delhi-based Intercon Systems and Eiko Computers of Mumbai have already been appointed resellers, the company is in the process of appo... distributors in the metropolitan cities

HCL Frontline Launches Multimedia Kits

Noida-based HCL Frontline, the ... office home office (SOHO) divisi... the US $ 500 million HCL gro... launched two multimedia kits. The ... Value kit and the India Premium kit ... Sound Blaster cards with plug and ... capabilities, CD ROM drives, and ... speakers. A Frontline support CD-... disk containing 400 software prog... including games and utilities is bu... with each kit. According to HCL F... line officials, the software programs ... CD are specially selected for Indian ... ences.

Says Manpreet Singh, president, ... Frontline, "Our attempt is to continu... develop and deliver products as per ... customers expanding needs."

The Sound Blaster cards, stereo sp... ers, and CD-ROM drives for the tw... come from Singapore-based Cre... Technologies, the US $ 1 billion g... leader in multimedia products.

Innovative Launches Multimedia Training

Madras-based Innovation Software ... ports (ISEL), a software develop... company engaged in the design ... development of Windows-based m... media software packages, is appoi... 100 multimedia training centers in ... dras. The learning centers will be op... ed by franchisees equipped with mul... dia computers and necessary software ... ering a wide range of subjects like m... ematics, physics, chemistry, biology, ... English—right from the nursery lev... class 12.

ISEL plans to open around 5,000 le... ing centers all over the country for ... benefit of school children. The ce... will relieve students of the boredo... studies by making learning interes... and absorbing. The ISEL policy is ba... on the assumption that though mul... dia applications have become the ... craze in the metropolitan cities of ... country, there is a visible dearth of ... training institutes, particularly in the s...

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IIT Launches LEDA

...w Delhi-based NIIT, a leading information technology service organization specializing in instruction, training, and software development, has ...ched LEDA (learning through exploration, discovery, and adventure) family ...s in Delhi.

A LEDA family club is a center in ...h an entire family can use computer-based facilities for fun and learning. LEDA centers are equipped with multimedia machines, and have a comprehensive collection of CD-ROM titles.

The LEDA family club concept was developed after interaction with students, teachers, and parents.

Says, Dr Dhruva Nath, head of the LEDA project at NIIT, "The key to LEDA programmes is their interactivity, which can captivate the child. Children like to have fun, and if learning can be made fun-filled, the educational process will be reinforced. As for adults, they can learn simulated programmes relating to Windows, dBase, a musical instrument, hone presentation skills, or simply play exciting edutainment games which help develop creative, analytical and problem solving skills."

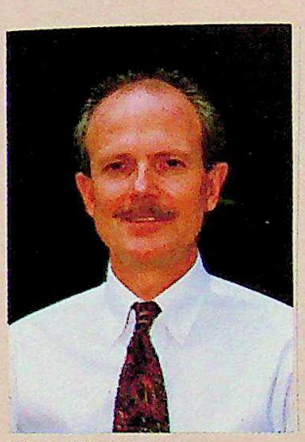
LEDA family clubs will be launched in other metropolitan cities soon.

AWARDS/APPOINTMENTS

...etlink

...tlink Business Systems, a ...w Delhi-based IT company ...ecializing in systems inte...ation, networking, and elec...nic publishing, has bagged ...e Commando Gold Cross ...ard instituted by Compaq ...dia, for being the best ...ler of Compaq PCs and ...ers in India. The award ...s presented by Compaq ...ntry manager Abhishek ...kherjee at a Compaq busi...ss partners' meet held in ...e capital recently.

Netlink is also the largest ...ler of the Unicorp prod...t range. Netlink officials ...m that the company regis...ed an unprecedented 300% ...owth in the last two years, ...d is poised to achieve a ...nover of Rs 1 billion by the ...m of the century.



Stacy Plemmons.

...CL HP

...cy Plemmons has been ...ppointed GM at HCL HP. In ...s new capacity, Plemmons ...ll develop and implement ...fferent HP computer sys...ms organization (CSO) ...ogrammes and processes ...HCL HP.

Says Plemmons, "HCL ...d HP are committed to ...engthen their relationship ...d bring world standards in ...l areas of operations. I look ...rward to working at HCL ..., as it continues to lead the ...T industry. As part of our ...ntinuing strategy to bring ...e-of-the-art solutions and ...ocesses to Indian custom..., we will be holding a series ...f customer events like seminars and conferences covering a variety of subjects over the next several months. Additionally, a series of product launches based on the PA 8000 processor are also in the pipeline."

Ajai Chowdhury, president and CEO, HCL HP, adds, "Plemmons brings to HCL HP a rich experience in a broad range of management responsibilities across marketing, sales development, R&D, and quality. We are extremely pleased to have Plemmons, a senior member of the HP marketing group amidst us. He has a great deal to offer to HCL HP operations in India." Stacy Plemmons has spent about two decades in senior managerial capacities at HP.

Wipro BT

Deepakjit S. Chatrath has joined the Bangalore office of Wipro BT as sales manager for very small aperture terminal (VSAT) systems. He will be responsible for the countrywide sales of the company's VSAT networking solutions. Prior to joining Wipro BT, Deepakjit was business manager at New Delhi-based Hughes Escorts Communications.



Deepakjit S. Chatrath.

PCL Mindware

Asoke K. Talukdar has joined Mindware, the Bangalore-based software exports division of PCL, as vice president (technical). Earlier, he was with Fujitsu ICIM in the capacity of GM, and with the mainframe division of Ashok Leyland Information Technology as associate vice president (technical).



Asoke K.Talukdar.

GTS to Implement Ericsson Project

Mumbai-based Global Tele-Systems (GTL), a telecom company specializing in turnkey telecom engineering solutions, has bagged a Rs 250 million Ericsson project for setting up cellular phone networks in the cities of Maharashtra, Gujarat, and Goa.

According to the terms of the contract, GTS will conduct initial surveys, provide site engineering services, install, and perform acceptance testing of the base transceiver systems. GTL will install and commission power management systems within these shelters. It will also support line-of-sight survey for the microwave transmission network. GTL will also manage services for installation of RF cables, towers, microwave and cellular antennae, BTS equipment, power plants, and so on.

GTL has a fully-equipped center in Pune, and a modern AutoCAD center for undertaking test and engineering documentation needed for the installation of GSM networks.

Fifth Generation Launches New Division

New Delhi-based Fifth Generation Software (FGSL), a company specializing in anti-virus software, has launched a new division which will function as an independent profit center. It will address the problem of the year 2000, offshore development, and computerization.

FGSL has already bagged an order from BigJo's India, to provide a turnkey solution for their super stores with Lan implementation and software for accounting, inventory, personnel, administration MIS, and so on. FGSL is expecting this division to provide 25% of its turnover by the end of 1997.

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12.9.96 14.9.96	AHMEDABAD CHANDIGARH	Hotel Cama Hotel Mount View	Rs.750* Rs.750*	*ODIN Computers India Ltd.* Academy House, A-16, Aruna Asaf Ali Marg, Qutab Institutional Area, New Delhi - 110 067.	*Mr. Krishnan*, Tel : (079) 562 1966 Fax : (079) 562 5000 *Ms. Harpreet Kaur*, Tel/Fax : (0172) 709 585

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CLOSING THE 'INFORMATION GAP'



Some people are bound to get better information technology than others, just as some inevitably have better access to food, shelter, transportation, medical care, education, and entertainment.

If you believe, as I do, that networked personal computers will dramatically improve educational and other opportunities, it's natural to worry about people who may not have access to the technology for a long time.

How will they compete, or even keep up?

On the other hand, if you believe that PCs and the Internet are overblown phenomena that won't really have much impact, then lack of access can't seem to be much of a problem.

Because I'm firmly in the first camp, I believe information technology should be widely available. This isn't really any different than my attitude about books, medicines, and other positive technologies. The more people who can have them, the better.

But I'm also a realist. Some people are bound to get better information technology than others, just as some inevitably have better access to food, shelter, transportation, medical care, education, and entertainment.

Political and community leaders are right to be concerned about a potential gap between information "haves" and "have-nots." Access to information is fundamental to success nowadays, and everybody should have the opportunity to use PCs and Internet connections.

It's not just the poor who are vulnerable to being left behind. Rural people, minority communities, and senior citizens are at risk too. Seniors may need to be encouraged—to be reassured that they are entirely capable of using these new machines and that their efforts will be well-rewarded.

I grew up during the Vietnam War, which among other things pitted one generation against another in the United States. I've seen the turmoil that exists when one generation, or one portion of our society, perceives the world quite differently than another.

But the potential for an "Information Gap," between different economic levels or different generations, shouldn't discourage anyone from taking advantage of PCs and the Internet. Foregoing the advantages of information technology won't help promote equal access.

Fortunately, time will help. Inequalities often smooth out somewhat over time, given changes in technology and the evolving marketplace. But thinking of this as a solution requires patience.

Reading books regularly was once the prerogative of the rich, because assembling a personal library was expensive. It took decades of public and private cooperation, in the United States and elsewhere, to build public libraries into the extensive, free community resources they are today.

In many neighborhoods, such as the one I grew up in, almost everybody frequents the library. About half the U.S. population visits one or more of the country's 16,000 library branches, which are twice as numerous as McDonald's restaurants—a statistic that surprised me, since there seems to be a McDonald's everywhere I turn.

Libraries are a smart way to subsidize public access to information, because the investment benefits a community of people and on a completely even-handed basis, with no stigma attached. No one says to somebody who uses a library, "Oh, you can't afford your own books."

Some sources of information have not been subsidized, except through libraries. Newspapers are cheap enough that nobody suggests free ones for the poor, and the purchase of television sets isn't subsidized either—but then, TVs are relatively affordable. Personal computers are getting more affordable, tool. Fully equipped PCs—not mere Internet terminals—can now be had for about $1,000 in the United States.

The PC industry is pursuing a Henry Ford-type of approach that assumes that the product must become both more powerful and less expensive if an ever-broader marketplace is to embrace it. Real progress has been made, but it will be many years before virtually everyone in a developed country has a PC—and many decades before PCs are ubiquitous in developing nations.

In the meantime, the same libraries that serve communities with books, newspapers, magazines, and even videos can also serve the computing and electronic-information needs of citizens. Libraries, schools, and community centers can be access points for everybody.

Before large-scale investment makes sense, though, a host of questions must be answered. Here are a few examples.

Should libraries charge for electronic services, the way they do for photocopies?

Will having a library or community center PC connected to the Internet encourage new people to come in, or will the connection mostly prove a convenience for people who already have computers at home?

To what extent will people use publicly accessible computers for enriching activities, such as learning about politics, history, literature, or job skills? Will a lot of people simply goof around, play games, or hang out in the more frivolous chat rooms?

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By Hirendra Chatterjee

Software Publishing: Bubbles That Need To Be Burst

There are at least two very tangible factors that augur well for the Indian software industry. The first is the near-unanimous opinion of experts that the customs duty reductions on imported computers and computer components announced in the 1996-97 budget will increase the demand for software appreciably. The second is the somewhat hopeful claim of the National Association of Software and Service Companies (NASSCOM) that the growth rate of the domestic software market has outstripped that of the export sector. If the second claim is true, it must be a direct consequence of the stringent anti-piracy law introduced in 1994, and the limited anti-piracy campaign launched by NASSCOM in some metropolitan cities.

For years, the only impediment in the growth of the domestic software industry has been the lurking fear of pervasive piracy. Users are now confident that their products will not be usurped by piracy moguls, who have been forced to go underground. If this is happening, it is by all means a welcome sign. There can be only one opinion on software piracy. That is a crime punishable by law.



Till about two years back, developing software for the domestic market involved calculated risks. Slick overseas products were available for a pittance, so why should anyone care to buy shabbily packaged domestic products? The result has been that while software exporting shops with substantial resources mushroomed in the metropolitan cities, the domestic market continued to be dominated by software packages imported from the US and Europe. Most of the companies that took to the lucrative export sector shied away from the domestic market. The overall scenario has not undergone any sea change.

There are some popular misconceptions about software development in India. For instance, it is generally believed that the country has a rich pool of professional software developers who compare well with their counterparts in the developed world. It is also believed that Indian programmers and software engineers are in demand in the US and Europe.

These and similar partial myths can be safely attributed to a sense of euphoria created and carefully nurtured by vested interests in government, semi-government, and private circles, who have tasted limited success.Indeed, these and other bubbles must be pricked.

Our country does have a growing reserve of qualified software engineers and programmers. It is also true that, given the right kind of environment and infrastructural support, they can probably compete successfully in the international market. But there is a gloomier side to the story, and it can be said without any hesitation, that this gloomier side predominates.

As an integral part of Indian industry, software publishing shares the depressing ethos of this sector, and is a victim of the same ailments that afflict assembly-line production. The run-of-the-mill software packages produced for local consumption generally come with grossly inadequate documentation, and the money that should have rightly gone into quality assurance, is diverted to advertising and promotion. Documentation is dismissed even by project leaders as a dispensable frill.

Some developers for the domestic market even believe that documentation will adversely affect their support services. If you provide all necessary information about a product to the end-user on a platter, why should he bother to call again?

The case of software developing firms executing contracts for companies in the US or Europe is even worse. In fact, their condition is so pathetic, most of the Indian firms developing software for foreign clients have been expressly instructed to maintain a low profile. If the word spreads that a product being marketed in US or Europe is actually developed in India, clients would drop it like a hot potato, and for good reasons. The managing director of a prestigious group specializing in software exports confided to me recently, that overseas contracts come to Indian firms easily because they quote extremely low rates (that others cannot match), and accept impossible deadlines (that respectable companies anywhere else in the world would reject out of hand).

The vast majority of software exporting enterprises operate from makeshift sheds in industrial areas, and even vacant garages, providing only the basic minimum of infrastructural facilities to their employees. Some do not even have a laser printer. Most prefer to use a convenient courier service to 'ship' packages, and have never thought it worthwhile to install a modem for communication and document transfer. Fax messages are sent and received through a third party, usually a neighboring company boasting a fax machine!

Very few players have adequate quality assurance and documentation resources of their own. The refrain seems to be: why spend money on technical writers, when the programmers can prepare the basic documentation by themselves, thus saving money for the organization? As for quality checks, lack of time is cited as the most common excuse. Most of the exporters find it difficult to meet deadlines. If they start Q/A activities, they would require at least two weeks over and above the not unusual time overruns. The result is that most shipped packages contain glaring bugs, and the documentation is of a very poor quality.

It must be added in parenthesis that the bigger and better known companies have abundant resources and can match the prowess of the best organizations in the world. They run away with the most lucrative contracts, are given a patient hearing in the corridors of power, and participate in official policy formulation. Their interests are taken care off more than adequately by NASSCOM.

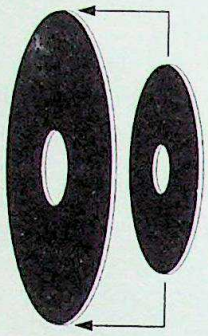
Some of the more conscientious software exporting firms are waking up after getting hard knocks from overseas competitors. Others just do not understand why their strategies fail to impress their overseas mentors. The silver lining in the cloud is that more and more firms are going in for ISO 9000. □

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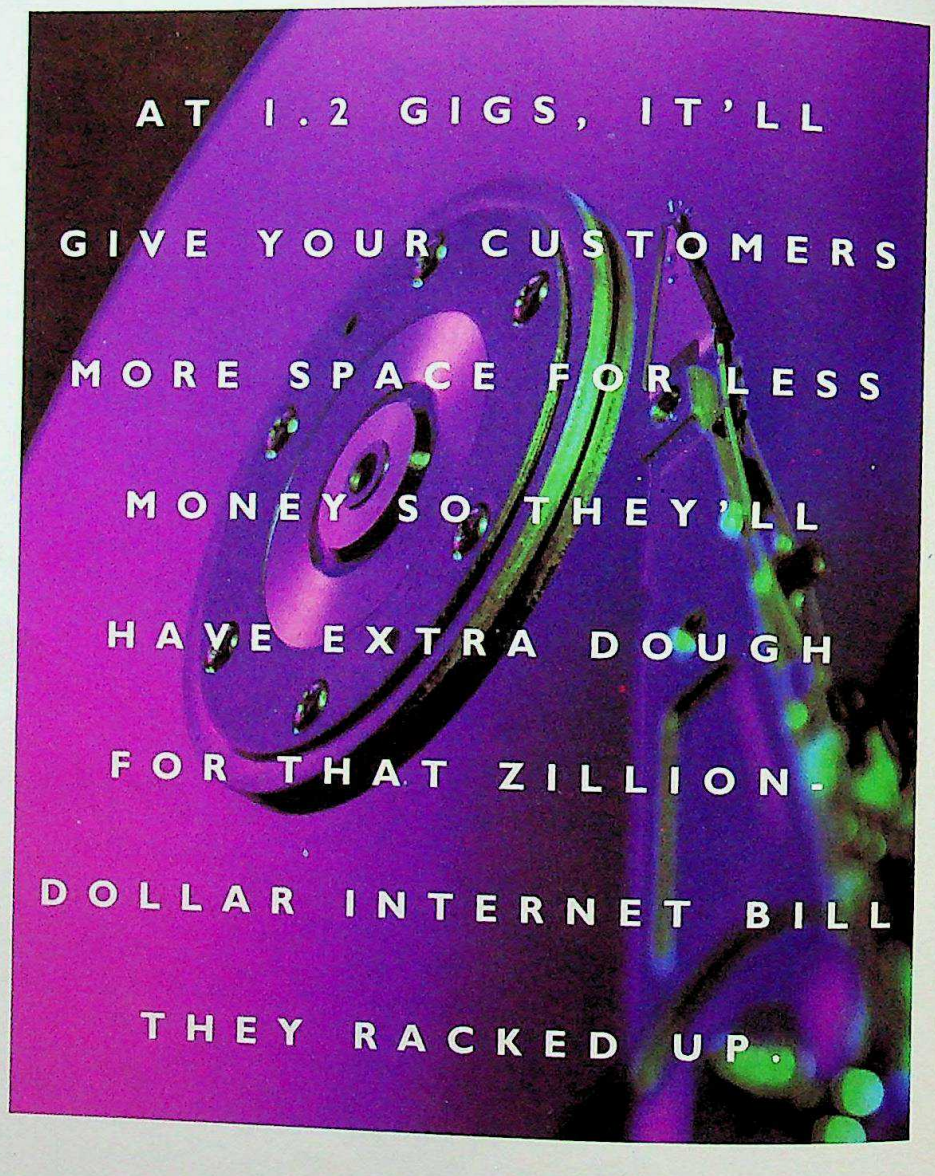
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pple Chief Maps Future

elio calls for streamd product lines.

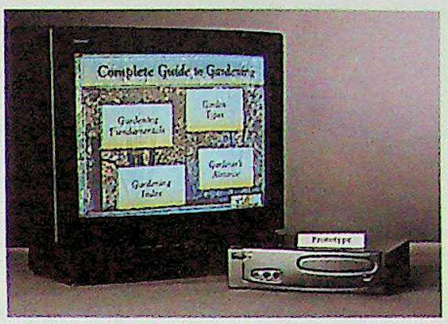
EO Gil Amelio, following up on his promise to cap his first 100 days at the helm of Apple with a plan for the company's re-, delivered a well-received ote speech at Apple Comput-vent Worldwide Developers' ference. "We must head off t many have said will be a long, decline into irrelevancy," elio said to a packed house of elopers and press, many of om had predicted that the de- might be short and fast.

Amelio spoke of plans to focus ple's organization and motiva- on two "megatrends," which defined as Pervasive Connec- and Pervasive Multimedia. called for a reorganization to te four groups that would us on information appliances, Macintosh, alternative plat- s, and imaging.

Cost reduction is another im- ative at Apple. Industry ana- s had suggested two main s to save Apple, both of which elio rejected because they put ts on the widespread appeal the Macintosh platform. The first was to drop several of the markets around the world in which Apple competes. The second was to focus the company exclusively on high-end appliances.

Instead of these courses, Amelio will implement cost reduction through "product-line simplification." Specifically, he'll reduce the number of Apple motherboards from nine to five in six months and the number of distinct Apple system models by 50 percent in six months. Amelio will also do away with separate architectures, leaving only one Apple OS.

Specific details about Apple products included the announcement that all Macintosh models will ship with at least 12MB of DRAM, and that Apple and IBM will jointly develop a notebook based on the Macintosh OS. Apple will also make the Newton Internet Enabler, which facilitates hand-held Web browsing, available to developers.



PIPPIN PLATFORM: *Apple's reorganization calls for focus on information appliances.*

Amelio focused especially on the new Information Appliance division. He said that the under-$1,000 Pippin system had sold 16,000 units in Japan, and that he had high hopes for the mid-May U.S. launch of a browser-enabled version of Pippin.

As for the Macintosh profit-and-loss center, Amelio stressed the importance of building Internet functionality into the Macintosh operating system. Macintosh server shipments, he said, were up 40 percent in April.

The keynote address drew rousing applause, but exactly what the companywide reorganization will mean for employees remains unclear.—*Sebastian Rupley*

Computer Meets Appliance

Single-function, mass-market devices—for the kitchen?

Diba, a Belmont, California, startup headed by a cadre of former Oracle executives—some of whom worked directly with Oracle CEO Larry Ellison to develop the "network computer"—is gathering interest from consumer electronics manufacturers with its somewhat offbeat concept, Interactive Digital Electronic Appliances (IDEAs).

What's a Diba IDEA? About 42 of them are in development, all designed to marry brand-new hardware with Diba's software. IDEAs are designed to facilitate simple, focused tasks—such as retrieving e-mail or looking up a yellow-page listing—in an inexpensive, ultra-easy-to-use device.

Diba is working on an under-$300 yellow terminal designed for an office hallway. The terminal will feature yellow-page listings, much like the yellow-page listings proliferating at such Web sites as BigBook. Another Diba IDEA is an e-mail-only terminal, designed to fit into heavily trafficked areas of a house, such as the kitchen. The e-mail terminal will feature just a few simple keys with labels like "Create a Message."

Several IDEAs will appear this year. According to vice president of marketing Joe Gillach, Diba is "cherry-picking applications for our IDEAs that have very high demand and big existing infrastructures." He adds that Diba's founder, Farzad Dibachi, who ran Oracle's new media division, "was convinced that the network computer from Oracle was imperfect, because it was being designed by committee. It doesn't solve the fundamental ease-of-use problem. It's basically a 386 at a 386's price."

According to Gillach, Diba is working on new hardware designs with overseas manufacturers. Zenith has announced it will collaborate with Diba on interactive television technology that will incorporate Web browsing. Zenith's new NetVision sets—featuring infrared trackball remote controls and Ethernet connectors—will let you browse the Web, access e-mail, and run Java apps. Zenith plans to introduce large-screen NetVision sets later this year.—*Sebastian Rupley*

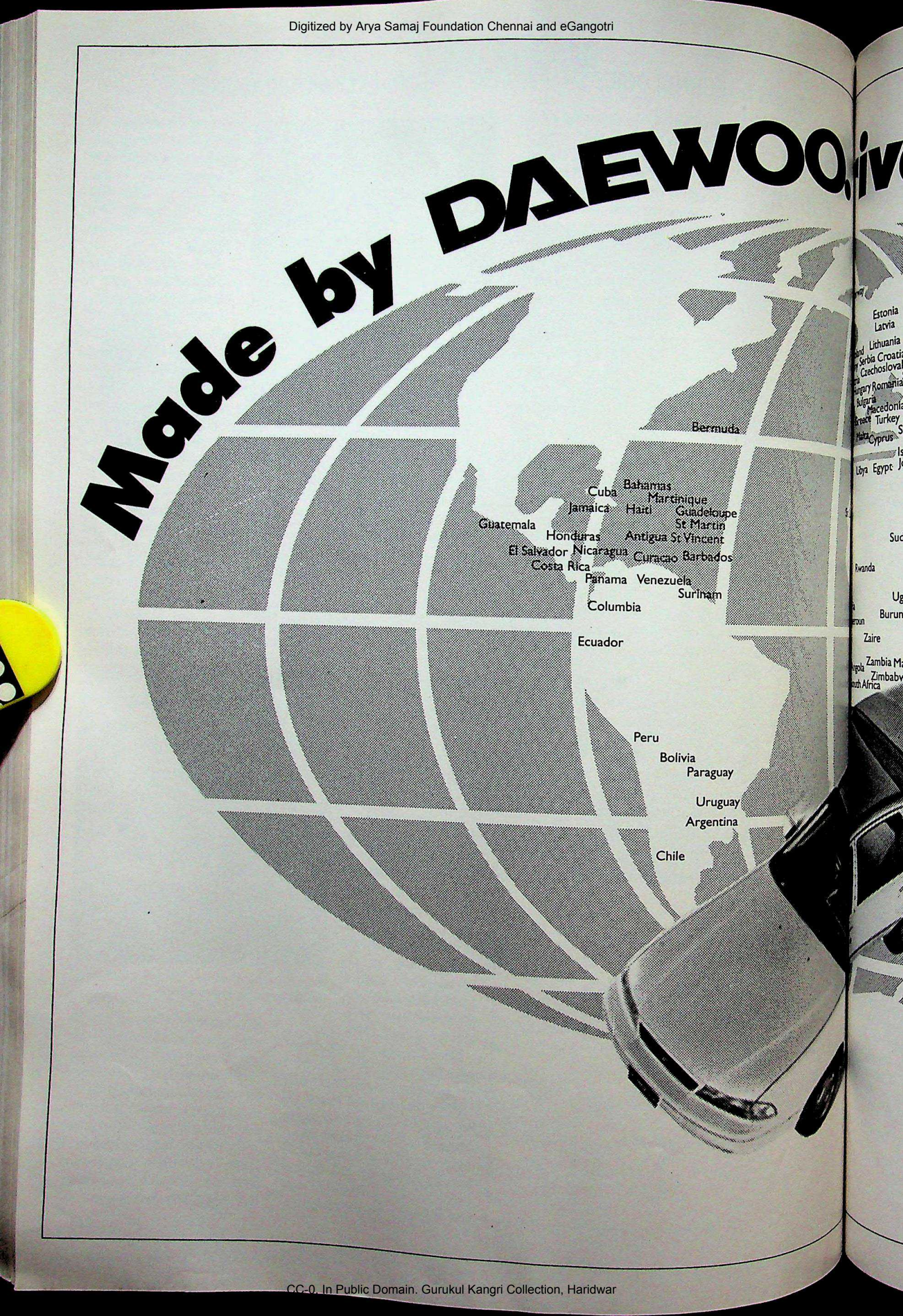


JUST HANGIN' AROUND: *The Diba IDEAs are designed for extreme ease of use.*

Trends gives you valuable insight into 'how things are shaping up' in new technology areas relevant to the world of PCs.

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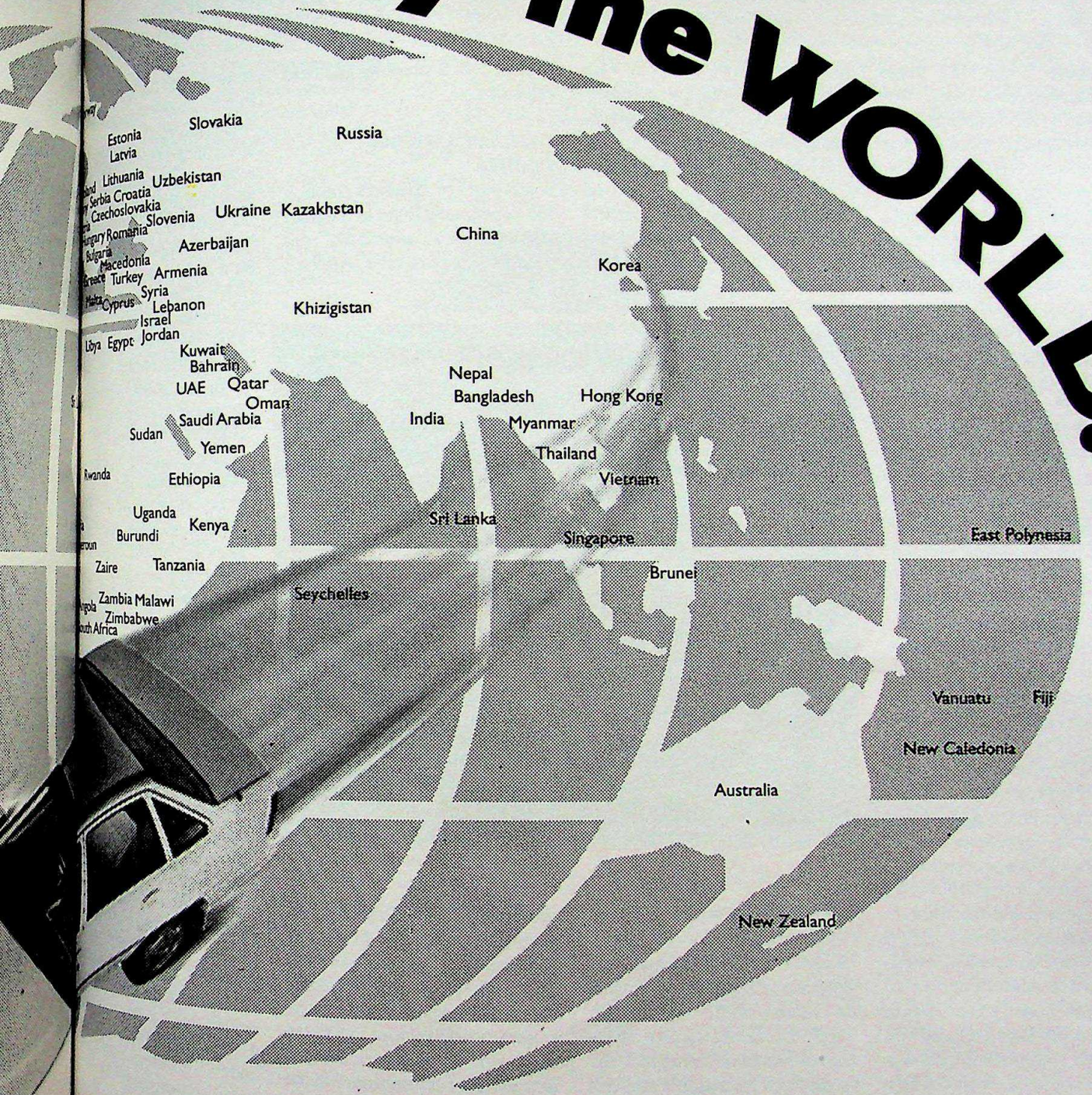


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The Font Forecast

Adobe and Bitstream recast type design for the Web.

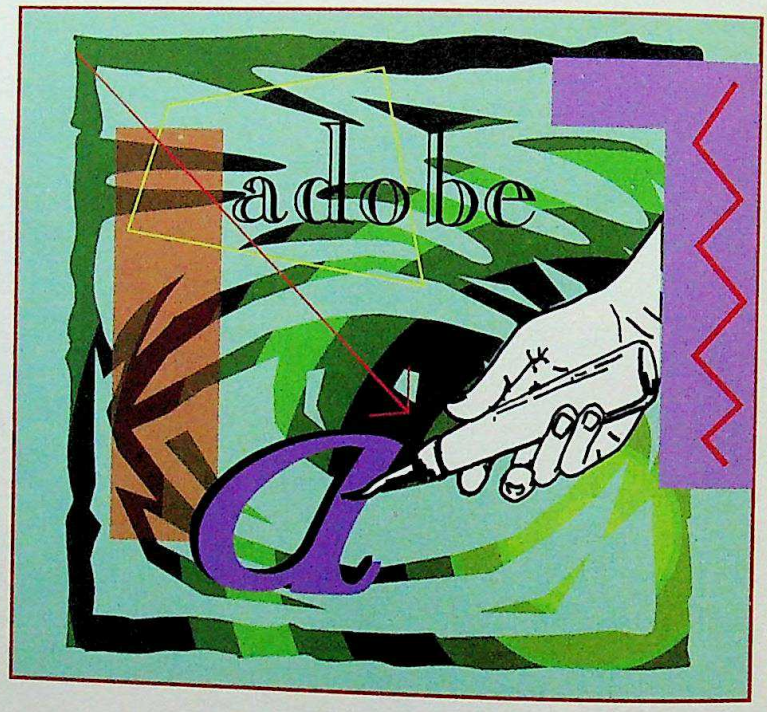
World Wide Web pages have come a long way from their roots as minimally formatted text pages. Inline graphics, tables, frames, and Java applets now provide an increasingly rich browsing experience. Still, Web developers today cannot easily duplicate the highly formatted appearance of a magazine page. Adobe Systems and Bitstream have developed font technologies that promise to eliminate much of that gap.

ADOBE'S OPENTYPE SOLUTION

The OpenType initiative defines a new universal font format that combines Adobe's Type 1 (PostScript) font technology, predominant in the Mac world, and the Microsoft TrueType font technology predominant on PCs. In addition to supporting OpenType in their future application and operating-system releases, Adobe and Microsoft will jointly use OpenType as a basis for defining HTML type extensions that give Web authors greater flexibility in presentation of text.

Currently, Web authors cannot alter the appearance of a browser's default proportional and monospace fonts beyond controlling bold and italic attributes and making gross adjustments to type size. The new type extensions will permit designers to specify particular typefaces, font sizes, and attributes. OpenType fonts will support compression techniques to make their delivery over low-bandwidth connections practical.

Adobe's existing Portable Document Format (PDF) provides a platform content authors can use to retain the look and feel of their print documents, complete with typefaces, high-resolution images, and page layout, while also providing hypertext links, text searches, and other interactive capabilities. Currently, PDF files can be viewed with Adobe's Acrobat viewer and Acrobat Amber viewer, which are configured as helper applications within a Web browser.



Adobe's newly announced Embedded PDF (EPDF) capabilities will permit PDF files to be embedded directly within a Web page. The EPDF viewer will take advantage of Netscape's plug-in architecture and Microsoft's ActiveX technology. Adobe is also extending its PDF viewers to enable them to fill in forms electronically, thus providing the same interactivity currently available through HTML forms but with far more control over formatting and field validation.

BITSTREAM'S TRUEDOC SOLUTION

Some parts of Adobe's solution will have to slug it out in the marketplace with alternative approaches. In particular, Adobe's font-fidelity technology for the Web will go head-to-head with Bitstream's already-available TrueDoc system. Font fidelity means that online designers can include any desired font in a document with the assurance that the font and all of its attributes will display properly—even on systems that don't have the actual font installed.

TrueDoc's Character Shape Recorder (CSR) records a font's character shape information in compressed form, then ...mits it along with the porta... ...tronic document. TrueDoc's ... ...acter Shape Player (CSP) ... ...ates the original font sha... ...attributes. Bitstream's Ste... ...nik points out that TrueDo... ...sents an already-available s... ...for including both TrueTy... Type I fonts in portable ... ...ic documents. "OpenTy... ...long way away," he says. "... ...Doc is available now."

In late April, Bitstre... ...nounced that Spyglass ... ...clude the TrueDoc CSP ... ...HTML component of Sp... ...Web Technology Kit. ... ...many versions of the M... ...Web browser are based o... ...glass' kit, Mosaic implem... ...will easily be able to ... ...TrueDoc in their browsers.

Bitstream has also dev... ...a Java implementation of ... ...Doc, which has already ... ...used in the development of ... ...ture, a portable docum... ...thoring tool from Future T...

Two competitors to A... ...Acrobat portable docu... ...distribution technology ha... ...adopted TrueDoc. Co... ...Ground Software's Co... ...Ground 2.0 for Windows ... ...Novell's Envoy both incorp... ...Bitstream's font-fidelity so...

One of the more intri... ...TrueDoc implementations ... ...be found in the HexWeb ... ...publishing applications ... ...HexMac International of ... ...many. This Macintosh-base... ...tension for QuarkXPress ... ...newspaper and magazine ... ...lishers quickly convert Q... ...files to HTML format for ... ...on Web servers.—*John Cy... ...and Jonathan Matzkin*

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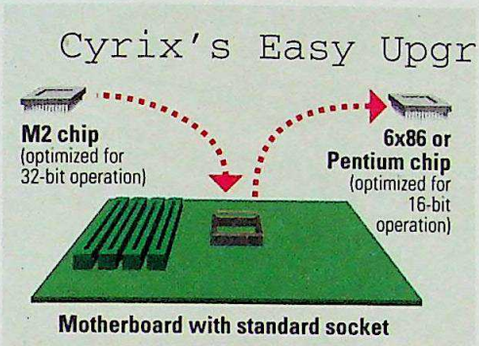
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Cyrix's Bold M2 Strategy

Upcoming chip simplifies the upgrade decision.

Rather than asking you to choose between the low road and the high road, Cyrix is offering a continuous path to 32-bit processing. By announcing plans for its M2 chip—a sixth-generation technology that will plug into a standard Pentium socket while offering both MMX compatibility and 32-bit optimization—the company is allowing users to purchase today's most adept mainstream hardware and gently upgrade to tomorrow's.

Although samples of the processor won't be ready until the fourth quarter and may not reach production quantities until the beginning of 1997, the recent success of the 6x86 chip has made Cyrix's plans a significant source of industry curiosity. New 6x86 P166+ systems—which have a clock speed of only 133 MHz—are outperforming most Pentium/166 machines and are even competing with immature Pentium/200 PCs.



Cyrix's M2 processor, optimized for 32-bit operation, fits in the Pentium's standard socket.

Like the 6x86, the M2 chip will offer most of the Pentium Pro's most attractive features—including register renaming, out-of-order completion, and speculative execution—but will also include a 64K primary cache. Currently, the Pentium Pro has a primary cache of only 16K, although it offers an on-board secondary cache as well. Unlike the 6x86, the M2 will boast optimization for 32-bit code and for MMX, an instruction set for boosting graphics and audio performance.

Of course, the Pentium Pro already offers 32-bit optimization and will offer MMX in its Klamath incarnation by the time the M2 is in production. What sets the two chips apart is the M2's compatibility with the 64-bit socket standard in the Pentium and the 6x86.

With Windows 95 here today and Windows NT 4.0 on the horizon, many corporations are struggling with hardware decisions. The Pentium and 6x86 are more suitable for Windows 95's 16-bit code, while the Pentium Pro is the processor of choice for Windows NT. Either you purchase today's most appropriate hardware and forsake it entirely when tomorrow's comes along, or you patiently endure archaic hardware for six months.

With MMX in the mix, the situation is even more difficult. You can vastly improve the performance of games and videoconferencing as soon as the Intel P55C ships with MMX this fall, but then you'll have to upgrade your entire system once you want 32-bit optimization.

Cyrix believes it has the answer. Users who require the highest performance under Windows 95 can purchase a 6x86 P166+ system today or a 6x86 P200+ machine (or a Pentium PC) this summer, then plug an M2 into the universal 64-bit socket after the first of the new year. Of course, if much of the corporate world decides to wait for the Klamath, then moves to it en masse, the 64-bit standard socket may not be very standard—or very available. Regardless, Cyrix is making its presence felt as no other Intel competitor ever has.—*Cade Metz*

FireWire Plays Starring Role in Simple, Fast PCs

High-speed bus architecture moves into PCI territory.

If you thought you'd heard the last of the bus wars, think again. Microsoft's announcement of the Simply Interactive PC (SIPC) initiative has added momentum to the IEEE 1394 (FireWire) standard for high-speed serial data transfer. FireWire's increasing prominence will challenge SCSI, the reigning champion high-speed serial bus, and even PCI, which, though popular, doesn't easily adapt to the new world of plug and play.

FireWire will be a key technology for the SIPC initiative. Among FireWire's advantages over SCSI is its ease of connecting devices (up to 63), done in a manner similar to plugging into a phone jack. You don't even have to turn off the power when connecting a new device to the bus.



Intel is somewhat less wholehearted in its endorsement. Bob Gregory, director of strategic marketing for the PCI components division of Intel, believes that FireWire will emerge as "a standard interface for lots of peripherals." Gregory says that although Intel is enthusiastic about FireWire, PCI still has the primary role. Emphasizing that "lots of stuff needs to go inside the box, on the motherboard, before you seal it up," he adds that though the FireWire "platform vision is good," it will not replace PCI, which has a maximum transfer rate in excess of 1 gigabit per second (Gbps), anytime soon.

Just how fast is FireWire? Specifications allow for transfer rates of up to 400 megabits per second (Mbps). Intel's Universal Serial Bus (USB), also included in SIPC announcement, is much slower, at 12 Mbps. USB, viewed as complementary to FireWire, is to be used for peripherals that do not require high speed, such as keyboards and mice.

USB and FireWire may compete for mindshare, but little direct competition actually exists. On the other hand, with plans for 1-Gbps FireWire already in the works, PCI's current speed advantage may not be enough to keep it at the center of the PC architecture.

In May, Apple announced that it will bring FireWire to its entire product line beginning early next year. And by 1998, FireWire will be built right into the motherboard of all its desktops and notebooks. If this is a harbinger of developments on the PC side, it could mark the beginning of the decline of PCI.—*Marc M. Groz*

PRODUCT REVIEWS

Product reviews in *PC Magazine India* enable decision-makers in the corporate sector ranging from CEOs to EDP executives to select the products that meet their specific requirements.

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PIPELINE

By Jake Kirchner

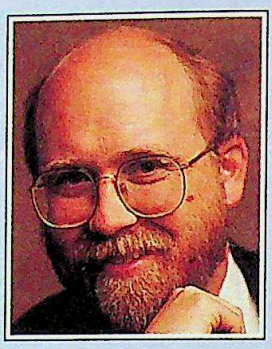
I'm Just Glad *Somebody* Wants My Business

It wasn't exactly like donating all of my tie-dyed T-shirts to Goodwill Industries, but it sure felt like the end of an era when I canceled my MCI Mail account the other day. After ten years through thick and thin, it was time for us to go our separate ways.

The final straw came in February, when MCI announced it would start charging a minimum $10 monthly fee for any MCI Mail box. The move was made to curb what the company called "service abuse." Ouch, I thought. I didn't like the idea that my decade-long relationship with the company had devolved into an abusive one. But I just couldn't see paying $120 a year to receive the one or two messages a month that trickled into my personal MCI Mail box.

An MCI spokesman further explained that people like me, who hold MCI Mail accounts almost entirely to receive mail (which used to cost me nothing) rather than to send mail (which generates income for the company), are thought of by MCI as having "vanity mailboxes." Ouch again. I would have thought there were lots of folks like me on the MCI rolls, but the company assured me otherwise. The spokesman said that a very small percentage of the 2 million or so MCI Mail users are affected by the new pricing structure and that less than 10 percent of those customers have dropped their accounts in response to it.

Well, I thought, I can't blame a company for forcing me out the door if it's losing money by servicing my account. And it's not as though I need the MCI Mail box along with my th... other e-mail addresses. (One of them, I should ... is a corporate MCI address.) Hey, no hard feelings ... my part—certainly not to the extent that I'd consi... ending my 15-plus years as a customer of MCI's ... distance services. (Note to AT&T: *Please* stop ho... ing me to switch!)



Free e-mail companies have figured out how to take abusive, vain people like me and still make money.

But I have to say I didn't like the fact that despi... my customer loyalty, I had come to be considered ... drag on MCI's business. And I'm a little disappoint... that a longtime industry leader like MCI could ... have come up with a more innovative approach ... this problem than hitting me up for more money in ... effort to make me mail or bail.

This is particularly annoying when there are co... panies fighting to offer me free e-mail accounts. Tr... innovative companies, like D.E. Shaw & Co. in N... York, which is advertising its new Juno serv... (*www.juno.com*), and Freemark Communicatio... in Cambridge, which is preparing a similar serv... (*www.freemark.com*), have figured out a way to ta... abusive and vain people like me and actually m... money by providing us with free e-mail services.

Both these companies are fielding full-blown e-mail systems ... ported by advertising rather than customer fees. Of course, I'm n... thrilled with the idea of having ads pumped into my e-mail—b... then, I said the companies were innovative, not saintly. MCI, ev... dently, is neither when it comes to e-mail.

Get Ready for Massive Hard Disks...

... and for plenty of software incompatibilities.

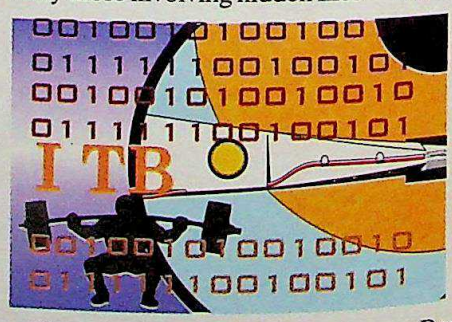
One of the cardinal sins of the operating system business is to commit incompatibility: Thou shalt not break existing software. Yet developers sometimes get away with it.

Microsoft is just about ready to deliver a service release—known as an OEM release—of Windows 95 to PC manufacturers that includes a new file system called FAT32 (file allocation table). (Microsoft is not adding it to the retail version.) FAT32 supports hard disks of up to 2 terabytes (TB)—a thousand times greater than Windows 95's current 2GB limit. FAT32 also greatly expands the number of clusters on a logical drive, so Windows 95 will no longer need to allocate a large amount of disk space to even the smallest files.

Unfortunately, FAT32 causes enough havoc with existing disk utilities that its advantages may not, for some users, outweigh the price of incompatibility. Changing the layout of the file structures on the hard disk will cause utilities such as Symantec's Norton Utilities Disk Doctor to fail. This is frustrating not only for end users, but also for developers, who must revise their products to accommodate the new layout.

And the problems don't end there. It's not only disk utilities that will need updating: Some antivirus utilities, compression tools such as Stacker, tape backup utilities, security products such as Norton DiskLock, and uninstallers will choke under FAT32.

FAT32 may also adversely affect games, since many of them use copy protection schemes—especially those involving hidden files or files in fixed positions—and direct disk access to increase speed. Still, the majority of software will not have a problem. After all, most software already works with NTFS under Windows NT.



While Microsoft is re... the upgrade, PC vendors ... the verge of shipping PCs ... hard disks larger than ... Some of these systems wi... before the service pack is r...

As a workaround, some ... vendors will partition large ... into two or more logical ... Some of them follow sta... schemes: typically, ... to the C: drive and ... rest to the D: drive. ... vendors will ask ... how they want their ... disks partitioned. B... concerned about ... hard disk layout. S... ask before putting ... order.

Because of the significa... compatibilities involved, ... PC vendors may opt to ... stall FAT32 only when ... sary.—*Larry Seltzer*

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First Looks

HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

PENTIUM PCs

Pentium/200: Fast PC or Low-Cost Workstation—Your Choice

By Cade Metz and John Morris

Intel's 200-MHz flagship Pentium processor is trying to be all things to all computer users. The Pentium/200 chip delivers with the best all-around performance under Windows 95 and enough horsepower to serve as an entry-level Windows NT workstation—at desktop PC prices—for heavy-duty engineering and graphics applications.

Like its 166-MHz predecessor, the Pentium/200 processor is manufactured using Intel's 0.35-micron semiconductor process. It comes in new packaging, called Plastic Pin Grid Array (PPGA), which improves the processor's ability to disperse heat in comparison with the old ceramic packaging—not an inconsequential consideration for a CPU that uses 17 watts of power. Despite the new trappings, the Pentium/200 processor has the same electrical characteristics as earlier chips and plugs into existing motherboards.

We tested the first five Pentium/200 systems we've seen: Dell's Dimension XPS P200s, the Gateway 2000 P5-200XL, the IBM PC350, the Micron Millennia P200, and the Sys Performance P200T2. Ranging in price from $3,100 to $4,500, each of these PCs came equipped with an Intel-made high-speed PCIset chip set, 512K of external cache, and a 17-inch monitor.

In addition, two systems stood out from the field: The Gateway P5-200XL came with a recordable CD-R drive, and the IBM PC350 had the first Universal Serial Bus (USB) plugs we've seen, although no USB devices exist.

We tested this group running Windows 95 (with 16MB of RAM) and Windows NT 3.51 (with 32MB of RAM). Aside from system memory, the system configurations were the same on both test suites.

Using Windows 95, these Pentium/200 PCs performed about 10 percent better than their 166-MHz counterparts on our Winstone 32 and Winstone 96 benchmark tests—less than you'd expect from a 17 percent increase in clock speed, which points to the

Continues on page 20



MEMORIES: *Dell's Dimension XPS P200s uses high-performance synchronous DRAM.*

WORLD WIDE WEB

LIBRARY Gurukul Kangri Vishwavidyalaya

Finding Your Needle in the Web's Haystack

By John Clyman

As the World Wide Web grows exponentially in size and scope, finding what you're looking for can seem a daunting task. The decentralized nature of the Web is part of the Web's allure, but it also leads to a sense of chaos.

Nimble entrepreneurs have stepped into this void, deploying a variety of tools called *search engines* that claim to tame the Web's tangled tentacles. Many of these search engines are among the most popular sites on the Web and have evolved into full-blown information clearinghouses that offer news wires, regular features such as rundowns of "cool" sites, and independent editorial content.

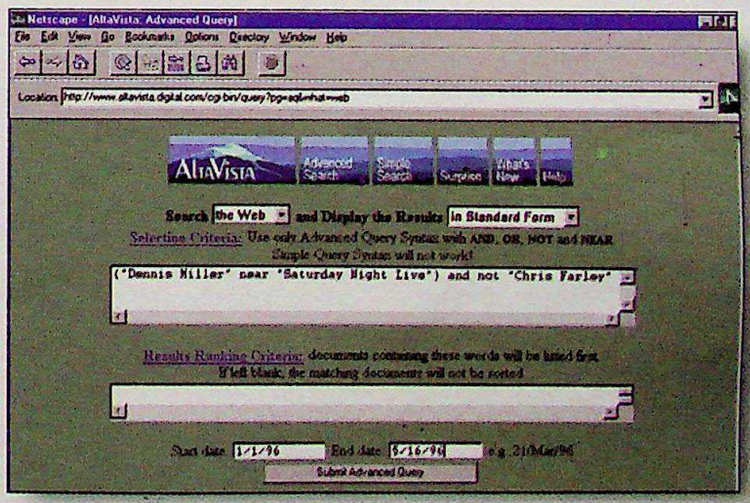
We looked at the most popular search engines and a handful of the lesser-known but worthwhile sites to see which deserve a bookmark in your browser. All of the sites we reviewed are free services. You can also find additional reviews on *PC Magazine*'s InternetUser site at *http://www.pcmag.com/IU*.

ALTAVISTA

Digital Equipment Corp.'s AltaVista (*http://www.altavista.digital.com*) is the most comprehensive and powerful full-text search engine on the Web today. In our test searches, it often unearthed five to ten times as many matching documents as its nearest competitor. And while it occasionally seemed overzealous, returning much chaff with the wheat, on the whole it was remarkably accurate.

To use AltaVista's default Simple Search, just type in the words you're looking for and press the Submit button. Because AltaVista will often find hundreds or thousands of matching documents, you'll also want to familiarize

Continues on page 23



ZEROING IN: *Digital's search engine, AltaVista, offers powerful search capabilities, including Boolean searches, proximity operators, and date ranges.*

Read

First Looks

for information on the latest product releases in India and the rest of the world.

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Pentium/200 PCs

Continued from page 19

possibility that these systems may be constrained by the 66-MHz system bus or I/O bottlenecks.

Expect to see some PCs sporting 75-MHz buses later this year as well as 200-MHz MMX Pentium processors that will push graphics and multimedia performance to new heights. In addition, Cyrix will have a 200-MHz-class chip by the end of the summer.

In terms of workstations, these Pentium/200s were only a tick slower than the 150-MHz Pentium Pro systems we looked at earlier this year . The one constant factor on both the Windows 95 and Windows NT tests was the dominance of the Sys P200T2: It not only consistently outperformed the rest but was one of the least expensive systems tested.

Whether you spend your day working in AutoCAD or Adobe Photoshop in Windows NT or using mainstream Windows 95 applications, these versatile Pentium/200 PCs offer a compelling combination of performance and value.

DIMENSION XPS P200s

The $3,099 Dimension XPS P200s extends Dell's tradition of delivering high-end PCs at aggressive prices with a mix of high-end peripherals and innovative memory architecture.

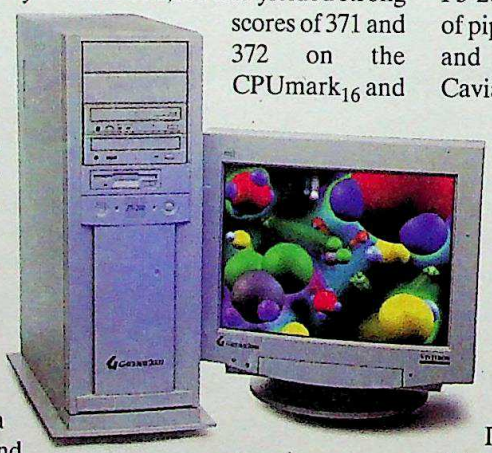
The Dimension XPS P200s is based on Intel's 430VX chip set and is equipped with 16MB of synchronous DRAM (SDRAM) and 512K of pipelined-burst cache. SDRAM can improve performance by streaming data to the processor at a continuous rate that's in tune with the system's clock.

Both the Dimension XPS P200s and the Sys P200T2 were equipped with the formidable 1GB Quantum Fireball Enhanced IDE hard disk. The problem is that Quantum is not producing them anymore, so expect Dell and Sys Technology to substitute another drive after Fireball supplies have run out.

The Dimension XPS P200s is rounded out with a Number Nine Technologies Imagine128 Series II PCI graphics card with 4MB of VRAM, an 8X CD-ROM drive, a U.S. Robotics Sportster V.34 modem, and a 17-inch UltraScan monitor. For audio, there are Altec Lansing speakers and a 16-bit Creative Labs Sound Blaster card.

The mini-tower case, which is identical to that of the Millennia P200, allows easy access to all components by removing a single side panel. Inside, the system has three PCI and two ISA expansion slots, as well as one shared connector.

The Dimension XPS P200s produced consistent though not dazzling scores on both Windows 95 and Windows NT tests. On Windows 95 tests, it notched the second-highest Disk WinMark 96 score of 1,180 and yielded strong scores of 371 and 372 on the CPUmark$_{16}$ and CPUmark$_{32}$ processor tests, respectively. The Dimension XPS P200s did not fare as well on our Winstone 96 and Winstone 32 benchmark tests, however.



DEEP STORAGE: *The Gateway 2000 P5-200XL is equipped with a recordable CD-R drive.*

Under Windows NT, the Dimension XPS P200s had the second-best score on our Winstone 32 tests, the C Compiler test, and the AutoCAD test. On the Photoshop tests, however, the Dimension XPS P200s lagged behind the group.

It should be noted that Dell doesn't fully support Windows NT—though we didn't experience any problems installing or running the operating system during testing.

The Dimension XPS P200s, which includes Microsoft Office Professional, is one of the best all-around PCs you can buy today.—*JM*

Dimension XPS P200s. List price: With Pentium/200 CPU, 16MB RAM, 512K external cache, 1GB hard disk, 8X CD-ROM, 17-inch monitor, $3,099. Dell Computer Corp., Austin, TX.
(Indian partners ESPL, Chandigarh; PCL, New Delhi; Rolta, Bombay.)

GATEWAY 2000 P5-200XL

The $3,899 Gateway 2000 P5-200XL stands out in this group by packing a Panasonic recordable CD-R drive into the system's full-size tower case.

Based on the Intel Tiger motherboard and 430VX PCIset chip set with 16MB of SDRAM, the P5-200XL is equipped with 512K of pipelined-burst external cache and a 2.5GB Western Digital Caviar Enhanced IDE hard disk.

Although most of the systems we tested included 4MB of video memory, the P5-200XL relies on 2MB of WRAM and a Matrox MGA Millennium graphics card; it's still able to produce 1,024- by 768-resolution graphics at 256 colors on its 17-inch Vivitron monitor.

In addition to the CD-R drive and an 8X CD-ROM drive, the P5-200XL has a 16-bit Ensoniq sound card with wavetable synthesis and Altec Lansing ACS-400 speakers; the package also includes an ACS-250 subwoofer and a Telepath V.34 modem. Inside the tower case, there are three PCI and two ISA slots, as well as a shared connector. One PCI slot is occupied by the interface card for the CD-R drive.

On Windows 95 tests, the P5-200XL's scores were in the middle of the pack. In general, it outperformed the Dimension XPS P200s and IBM PC350 but lagged behind the Millennia P200 and the Sys P200T2. The exceptions were



PC WITH A VIEW: *The IBM PC350's monitor led the pack.*

the P5-200XL's results on processor tests, which were among the lowest in the group.

The P5-200XL remained solidly in the middle of the group Windows NT tests with scores 121 on the Winstone 32 tests and minutes 43 seconds on the AutoCAD test, as well as average sults on Photoshop applications. Its time of 2 minutes 53 seconds on the C Compiler test was one the worst, however.

The P5-200XL includes Microsoft Office 95 and a slow CD-ROM–based software. In spite its less-than-stellar performance on our benchmark tests the P5-200XL, with its built-in recordable CD-R drive, could be the first of a new breed of inexpensive multimedia workstations.—*JM*

Gateway 2000 P5-200XL List price: With Pentium/200 CPU, 16MB RAM, 512K external cache, 2.5GB hard disk, 8X CD-ROM, 17-inch recordable CD-R drive, 17-inch monitor, $3,899. Gateway 2000 Inc., No. Sioux City, SD.
(Indian partner DCM Vikram Tower, 4 Rajendra Place, New Delhi. Price : Rs 3[illegible])

IBM PC350

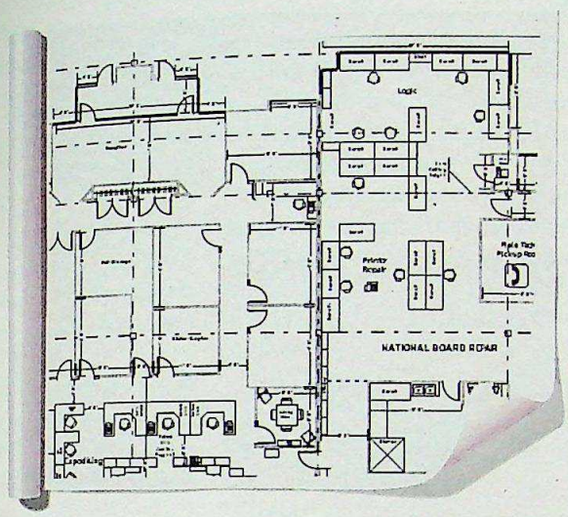
At $4,462, the IBM PC350 is far the most expensive PC in high-flying group. It is also graphics paragon that is built around one of the best desktop monitors available.

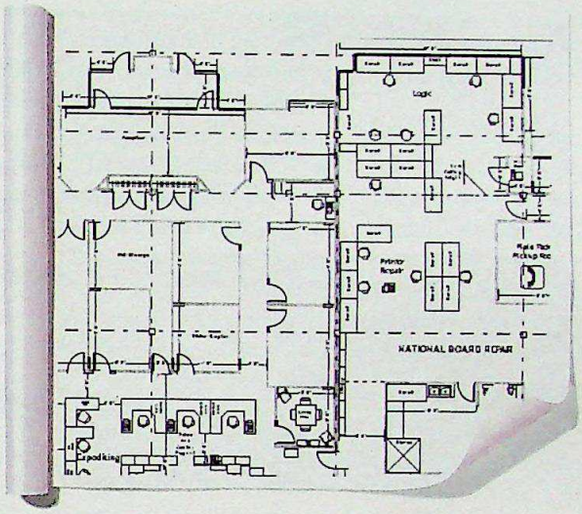
Although each of the other

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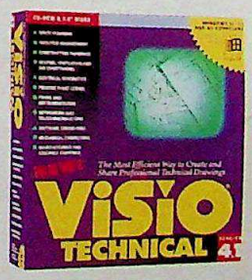


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tems in this roundup is limited to an upright tower configuration, the IBM chassis can also lay flat, like a desktop case—either on its own or beneath the monitor. The unit's plastic cover is easily removed to reveal its carefully arranged components: a 430HX chip set, 16MB of RAM, and 512K of external cache. A 1.6GB Western Digital Caviar Enhanced IDE hard disk and a Matrox Millennium card with 4MB of WRAM complete the package.

On the front of the machine, there's a retractable plastic panel that can be locked to protect the 6X CD-ROM drive and the floppy disk drive. This leaves one available 5.25-inch bay and one 3.5-inch bay; there are four shared PCI/ISA slots and one ISA slot.

The rear of the machine offers a glimpse at the future of PCs: The system's pair of USB interfaces is the first set of USB plugs we've seen on a PC. Too bad that there are neither peripherals nor drivers available for them at this time.

The PC350 was an average to below-average performer. On Windows 95, its midrange scores on the Winstone 96, Graphics WinMark 96, CPUmark$_{16}$, and CPUmark$_{32}$ tests were offset by poor showings on the Disk WinMark 96 and Winstone 32 tests. With the only 6X CD-ROM drive in a sea of 8X units, the PC350 posted a CD-ROM WinMark 96 score that lagged behind the group.

The Windows NT tests told a similar story: The PC350's AutoCAD and C Compiler results were each the slowest recorded, and its Winstone 32 score was the second-lowest. The system's Photoshop results were bested only by the scores of the Gateway P5-200XL and the Sys P200T2.

The bright spot was the IBM P70 17-inch monitor, which consistently rendered images with immaculate clarity. There was never obvious granularity or image-[illegible] tion. This graphical [illegible] however, was marred by the [illegible] tem's muteness, because [illegible] sound card nor speakers were [illegible] cluded.

In terms of raw performance the PC350 had difficulty keeping up with the Joneses, but the [illegible] gration of USB plugs and [illegible] graphics performance makes [illegible] system ahead of its time.—*CM*

IBM PC350. List price: With Pentium/200 CPU, 16MB RAM, [illegible] external cache, 1.6GB hard [illegible] 6X CD-ROM, 17-inch monitor, $4,462. IBM PC Co., Armonk, [illegible] *(Indian partner TISL, TISL [illegible] Golden Enclave, Airport Road, Bangalore 560 017; Tel: 5262[illegible] Fax: 5268344.)*

MICRON MILLENNIA P200

A thoroughly cutting-edge PC, the $3,257 Micron Millennia P200 offers an excellent mix of value and performance.

Although the Millennia P200 uses the same chassis as the Dimension XPS P200s, its components are decidedly different. A Micronics motherboard includes a 430HX chip set, 512K of external cache, 16MB of EDO RAM, and an expansive 2.5-GB Western Digital Caviar Enhanced IDE hard disk. The Millennia P200 debuts the Diamond Stealth 3D 2000 graphics card, which makes use of EDO RAM as well as an S3 ViRGE 3D accelerator chip.

The system also offers a 17-inch Micron monitor, an 8X CD-ROM drive, and a Creative Labs Sound Blaster card with wavetable synthesis. Expansion slots include three ISA slots, three PCI slots, and one ISA/PCI shared slot.

On Windows 95 tests, its Winstone 96, Winstone 32, and Graphics WinMark 96 scores were second to those of the Sys P200T2. The Millennia P200's solid benchmark test performance was marred by a few missteps.

When running Windows NT, the Millennia P200 turned in an anemic Winstone 32 score of 101, but it rebounded to deliver average AutoCAD, Gaussian Blur, and Photoshop Lighting

PERFORMANCE TESTS

Pentium/200 PCs

PC MAGAZINE LABS

The Sys Performance P200T2 dominated this high-flying group of 200-MHz Pentium PCs on both Windows 95 and Windows NT tests. The Dell Dimension XPS P200s and Micron Millennia P200 were close behind on most Windows NT tests. All five of the systems we tested outperformed the average comparably equipped Pentium/166 PC.

To measure performance under Windows 95, we used ZD Winstone 96, Version 1.0; ZD Winstone 32, Version 1.0; and ZD WinBench 96, Version 1.0. Each system came with 16MB of RAM and a 6X or faster CD-ROM drive.

To evaluate performance under Windows NT, we used ZD Winstone 32 and test scripts for three high-end applications. Each system was equipped with 32MB of RAM and ran the workstation version of Windows NT 3.51.

Windows 95

Higher scores represent better performance. Bold type denotes first place	ZD Winstone 96 Score	ZD Winstone 32 Score	ZD Graphics WinMark 96 Mpixels/sec	ZD Disk WinMark 96 Score	ZD CPUmark$_{16}$ Score	ZD CPUmark$_{32}$ Score	ZD CD-ROM WinMark 96 Score
Dell Dimension XPS P200s	78	99	34.2	1,180	371	372	712
Gateway 2000 P5-200XL	80	102	32.9	1,140	366	364	805
IBM PC350	80	99	35.9	1,040	375	366	603
Micron Millennia P200	82	103	38.4	1,110	310	371	749
Sys Performance P200T2	**86**	**104**	**38.6**	**1,240**	**382**	**381**	**813**
Average Pentium/166 PC (June 25, 1996)	73	91	28.9	1,131	316	317	N/A

N/A—Not applicable: We are not reporting this score because the Pentium/166 PCs we reviewed included 4X as well as 6X and 8X drives.

Windows NT

▲ Higher scores represent better performance. ▼ Lower scores represent better performance. Bold type denotes first place among Pentium/200 PCs.	ZD Winstone 32 Score ▲	AutoCAD Min:sec ▼	C Compiler Min:sec ▼	Photoshop Gaussian Blur Seconds ▼	Photoshop Lighting Effects Seconds ▼
Dell Dimension XPS P200s	124	4:36	2:46	60	84
Gateway 2000 G6-200	N/A	3:26	2:06	48	67
Gateway 2000 P5-200XL	121	4:43	2:53	58	66
HP Vectra XU	N/A	3:56	2:22	31	60
IBM PC350	122	4:53	2:56	57	68
Micron Millennia P200	101	4:44	**2:45**	59	71
Sys Performance P200T2	**129**	**4:35**	2:49	**55**	**64**

* Reported for comparison. N/A—Not applicable: This system was tested before ZD Winstone 32 was available.

The **AutoCAD** test exercises a broad range of system functions, including the CPU (both integer and floating-point math), disk, and video. The AutoCAD script opens files, performs 2-D and 3-D manipulations, and renders in 3-D. The **C Compiler** test uses the World Wide Web Consortium (W3C) Reference Library benchmark test, which consists of 119 files that contain 1.1MB of code. Programs were compiled using Version 7.20 of Symantec's C++.

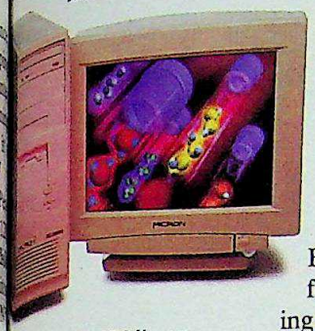
We use two plug-in filters for Adobe Photoshop to test the integer and floating-point math abilities of these five systems as well as their suitability as high-end graphics workstations. The **Gaussian Blur** test is composed of integer operations and applies a blur to a high-resolution digital photograph, while the **Lighting Effects** test is composed of floating-point operations and changes the placement and intensity of lighting in an illustration.

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...ics test scores. The bright ...ver was its C Compiler test re... which was the fastest of the ... machines.

A good performer packed ...h solid components, the Millennia P200 pro...



...E: *The $3,257 Micron ...ennia P200 provides a lot of ...for the dollar.*

...es a lot of PC for the money.—*...M*

...ron Millennia P200. List price: ...h Pentium/200 CPU, 16MB ...AM, 512K external cache, ...GB hard disk, 8X CD-ROM, ...ch monitor, $3,257. Micron ...tronics Inc., Nampa, ID. *...o Indian partner.)*

SYS PERFORMANCE P200T2

In keeping with the company's history of producing first-rate made-to-order corporate machines, Sys Technology surrounds the $3,099 Sys Performance P200T2's cutting-edge processor with the market's most adept and expensive components.

Like the IBM PC350 and the Millennia P200, the Sys P200T2 is built around the 430HX chip set, 512K of external cache, and 16MB of EDO RAM. The system's performance edge lies in its pairing of a Quantum Fireball 1.3GB hard disk and a Matrox Millennium graphics card with 4MB of WRAM—an all-but-unbeatable combo.

The Sys P200T2 is housed in a cramped mini-tower case, which provides two available 5.25-inch bays and one unused 3.5-inch bay. The system uses a GigaByte motherboard, along with an 8X CD-ROM drive and a Creative Labs Sound Blaster 32PnP Wavetable sound card. Accouterments include a 17-inch MAG Technitron monitor, two MLi 65 stereo speakers, and a Cardinal V.34 modem.

The Sys P200T2 produced a string of Windows 95 performance records on our Winstone 96 (86), Winstone 32 (104), Graphics WinMark 96 (38.6 million pixels per second), and Disk WinMark 96 (1,240) tests. The system's 382 and 381 scores on our CPUmark$_{16}$ and CPUmark$_{32}$ processor tests, respectively, were also unmatched.

Performance under Windows NT was equally stunning. Most impressive was the Sys P200T2's Photoshop Lighting Effects test result, which was even faster than that of a Pentium Pro/200 system.



OVERACHIEVER: *The Sys Performance P200T2 outperformed the rest of the Pentium/200 pack.*

Who says the best has to cost more? The Sys P200T2 shows that economy and speed are not mutually exclusive terms.—*CM*

Sys Performance P200T2. List price: With Pentium/200 CPU, 16MB RAM, 512K external cache, 1.3GB hard disk, 8X CD-ROM, 17-inch monitor, $3,099. Sys Technology, Cypress, CA.

(No Indian partner.)

Web Search Engines

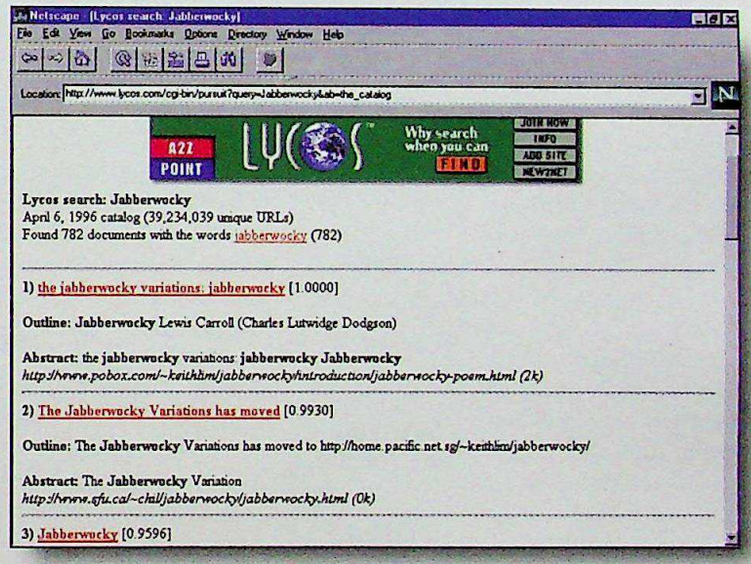
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...self with its Advanced Search ...ture. There you can specify ...olean operators (*and*, *or*, and ...specify the distance between ...words; perform case-sensitive ...ches; limit your searches to ...b pages with a specific date ...ge; use wildcards, either at the ...of a search string or within a ...rd; and restrict your search to ...cific elements, such as links. ...rthermore, you can ask Alta...ta to give priority to documents ...t contain certain words.

Unlike many search engines, ...aVista makes no attempt to ...e sites or organize them into a ...rarchy. But if you're looking ...a Web page (or Usenet discus...n group) that contains specific ...t, there's no better place to ...in your search.

...CITE

...e of the first search engines, ...cite (*http://www.excite.com*) is ...ll-text search tool that seems ...e slipping behind the compe...m. In our test searches, Excite generally found fewer sites than the other search engines. And Excite has a number of quirks that detract from its appeal.



WORD FINDER: *Lycos highlights your search terms in its listing of the search results.*

For example, on the opening search screen, you must decide whether to search "by keyword" or "by concept." But the two types of searches usually produce identical results. In addition, Excite doesn't let you modify your original query from the results page and resubmit it; instead, you must first click on the Refine Search button. By default, Excite ranks search results by degree of confidence, and it provides a rating from 0 to 100 percent. But we found this rating a poor indicator of the actual relevance and quality of information.

We did like Excite's "query-by-example" feature, which is the same as InfoSeek's "similar pages" link. Like its competitors, Excite contains Web-site reviews and a Reuters news feed, plus comics and columns.

Although some of the excitement has worn off, Excite continues to offer a variety of news and features with its basic search engine, and its "query-by-example" feature can be useful.

INFOSEEK

InfoSeek Guide (*http://guide.infoseek.com*) is a free search service from InfoSeek Corp., which also offers a paid service called InfoSeek Professional. The Professional service includes business periodicals and news wire services, as well as the Web pages, Usenet discussions, and other resources searched by InfoSeek. Like Excite and Lycos, InfoSeek offers categorized site reviews in addition to full-text searches of Web pages.

On our tests, InfoSeek generally found sites that had the information we were looking for, although its listings offered nowhere near the breadth of

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AltaVista's. If you click on the "similar pages" link, InfoSeek tries to find any pages whose contents correlate closely to those of the page you selected—without requiring any additional refinement of the search on your part. This feature is particularly helpful if you're searching for a word that can have different meanings in different contexts.

Furthermore, when you perform a search, InfoSeek often provides links to topics it suspects are related; if you click on one of those links, you'll jump to that area in InfoSeek's site reviews, which are similar to those of Yahoo! but less extensive. The related-topics list occasionally proved unreliable, though; when we searched on a popular brand of beer, InfoSeek suggested "Macintosh Webhelper applications."

InfoSeek supports Boolean operators, case-sensitive searches, and matches against complete phrases, and it lets you specify whether a pair of words should be *adjacent* or *nearby* (the latter meaning within 100 words).

Altogether, InfoSeek is a competent, useful, and feature-rich Web search engine, although its related-topics function can sometimes lead you astray.

DECISION MAKERS READ PC MAGAZINE INDIA

LYCOS

Like InfoSeek, Lycos (*http://www.lycos.com*) combines a full-text search capability, called the Lycos Catalog, and a pair of Yahoo!-style searchable Web-site indexes. Unfortunately, neither index—Lycos's A2Z Directory nor Point's list of the so-called Top 5 Percent of All Web Sites—is particularly comprehensive, and our test searches quickly convinced us that Yahoo! is a better place to start.

On the other hand, the Lycos Catalog is relatively powerful. Lycos was consistently able to find more relevant Web pages than either Excite or InfoSeek, though it still paled in comparison with AltaVista. Lycos highlights occurrences of keywords in the results it returns, which helps you see at a glance whether the words are used in the context you intended. Lycos "stems" words that you enter, so that a search on *food* also uncovers pages that contain the word *foods*.

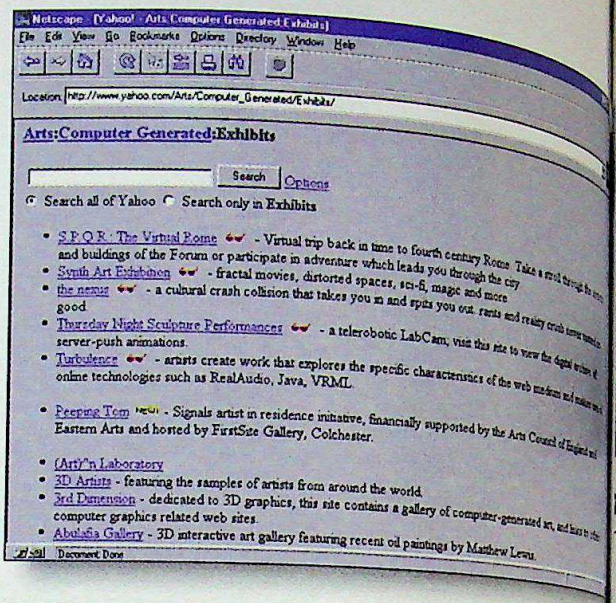
When you dig deeper, though, you'll quickly discover Lycos's limitations. You can tell it to exclude pages that contain a certain keyword, but you can't require that a keyword be present. Nor can you match complete phrases. As a result, some searches can produce completely inappropriate results. And though Lycos lets you use wildcards, you must use the "$" symbol rather than the near-universal asterisk. There is no Boolean search capability.

On the whole, Lycos is a powerful search engine, but its search tools are less than intuitive.

WEBCRAWLER

Owned by America Online's Global Network Navigator, WebCrawler (*http://webcrawler.com*) is an adequate but hardly extraordinary Web search engine. In our test searches, it typically returned relatively few matches compared with the other engines. Although WebCrawler includes GNNselect Web-site reviews, the reviews are not searchable, as they are in Lycos.

To its credit, WebCrawler maintains a spartan and unimposing user interface that belies its sophisticated search tools. The site handles Boolean operators, quotation marks (to denote a sequence of words that must be matched exactly), and *adjacent* and *near* operators. But without a substantive list of sites underlying its search functions, WebCrawler is less effective than some of the alternatives.



FRIENDLY FACE: *Yahoo!'s human touches are evident in many places, such as the sunglasses icons, which indicate cool sites, and the useful site summaries.*

YAHOO!

The first and probably most well known of the search engines, Yahoo! (*http://www.yahoo.com*) is technically not a search engine at all—it's a searchable index. Although most search engines use automated agents, called *spiders*, to follow every hyperlink on a page and tools that automatically index the individual word on that page, Yahoo! relies on real people to examine sites, summarize their contents, and place them into the appropriate sections of Yahoo!'s hierarchical category structure.

A good example of this human approach is the ZD Net site maintained by *PC Magazine*'s parent company, Ziff-Davis Publishing. The site is listed under the categories Business and Economy, Companies, Publishing, ZD Net, and Ziff-Davis Publishing. The Yahoo! site includes links to site reviews published by *Yahoo! Internet Life*, a joint venture of Yahoo! and Ziff-Davis.

When you visit Yahoo!, you can either drill down through the categories or search for terms that appear either as part of a category title or in a site's summary. Yahoo! affords little control over the specifics of the search, but that's generally not a problem because the site's careful organization yields highly accurate results.

Because the search results are listed by category, it's easy to locate similar sites by simply clicking on the matching category headings. Yahoo! highlights best sites in each category with sunglasses icon and prefers positioning in the search list.

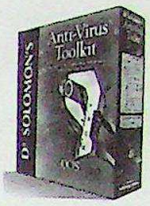
The downside of Yahoo!'s proach to cataloging the Web hand is that the selection nowhere near as deep or as as that offered by AltaVista. thermore, Yahoo! doesn't you to perform a full-text s for specific words on a page words must appear in the ca ry name or site summary. result, Yahoo! is particu weak when it comes to loc for proper names, such as p uct brand names. Yahoo! incorporate results of full searches performed by a s rate search engine, Open but we found that a poor sub tute for a dedicated full search tool.

Beyond its Web-site in Yahoo! offers searches of e addresses and Usenet n groups, a news feed f Reuters, daily and weekly lis of cool Web sites, and an in major new launches. For you cybersurfers, Yahoo! maintains separate Web site, Yahooligans (*http://www.yahooligans.com*) that focuses on sites of interest kids and is screened for inapp priate content.

Yahoo! trades advan search controls for an in handpicked sites that consis ly produces relevant and u search results.

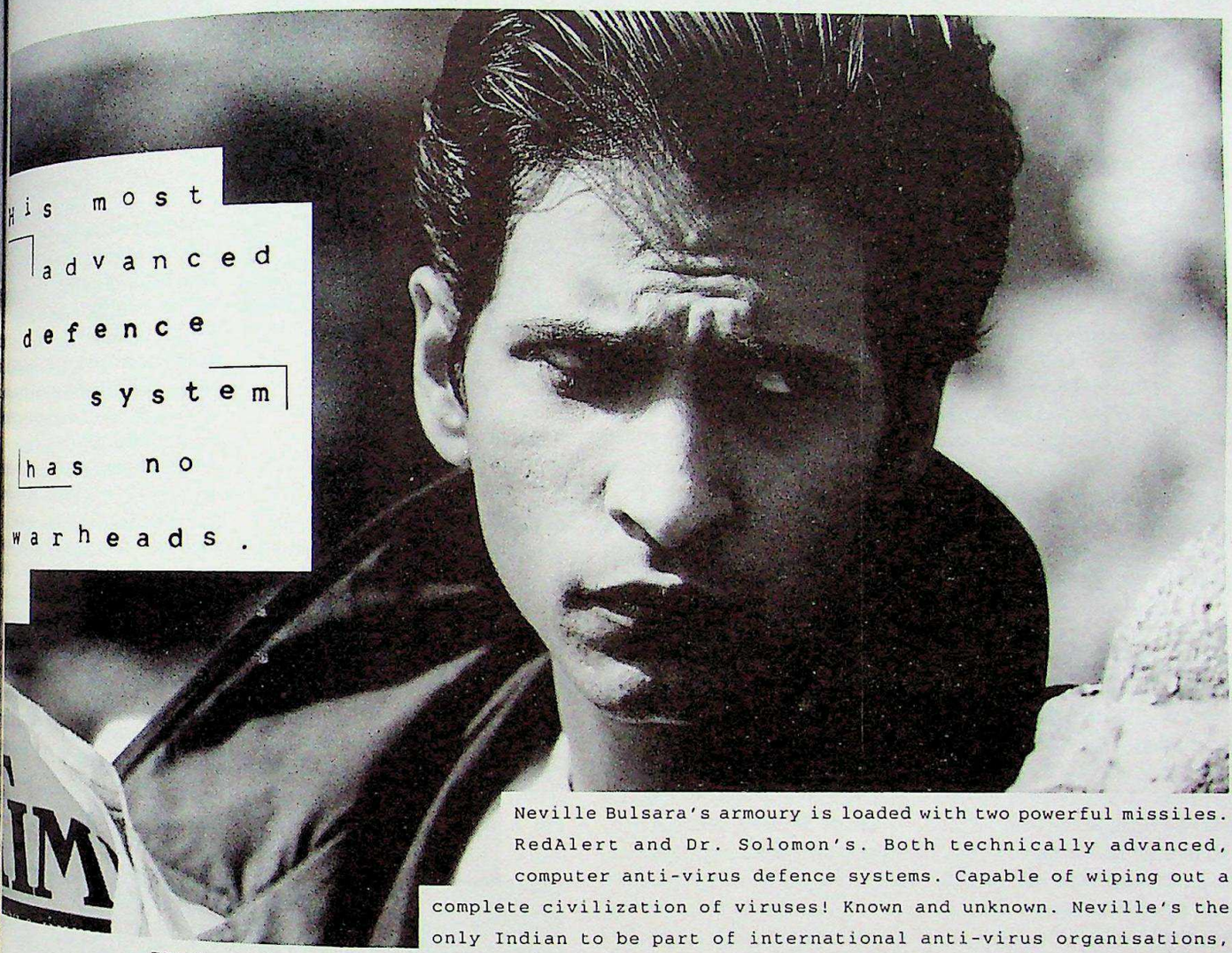
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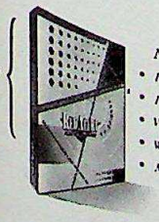
Dr. Solomon's Anti-Virus Toolkit

- *Winner of the Queen's Award for Technological Achievement*
- *Identifies the most complex polymorphic viruses*
- *Detects unknown viruses*
- *Scanning speeds of over 7MB per second*
- *Available for DOS, Windows, Windows '95, OS/2, Netware, SCO Unix and Macintosh*



Neville Bulsara's armoury is loaded with two powerful missiles. RedAlert and Dr. Solomon's. Both technically advanced, computer anti-virus defence systems. Capable of wiping out a complete civilization of viruses! Known and unknown. Neville's the only Indian to be part of international anti-virus organisations, EICAR and VFORUM. He has received an international technical excellence award. His unit, N&N, is armed for any crisis. Today, they guard ICICI, Coca-Cola, Pepsi, ITC, ESSAR, The Defence sector. Your peace-of-mind is always on his mind. Except, you won't find any warheads here.

Call him before the viruses get you.



Neville Bulsara's RedAlert

- *Includes Dr. Solomon's FindVirus Scanner*
- *India's highest-rated anti-virus software*
- *Virus independent. Protects against future viruses*
- *World's fastest integrity-checker*
- *Multi-layered approach for maximum security*



N&N
Systems and Software

A Neville Bulsara & Nadir Karanjia Venture

105, 1st Floor, Om Chambers, 123, A. K. Marg, Kemps Corner, Bombay 400 036. Tel: 368 0512/17/18 Fax: 368 0513. Fort, Tel: 282 3897, 288 6505. Mahim, Tel: 444 9124.

Impressions

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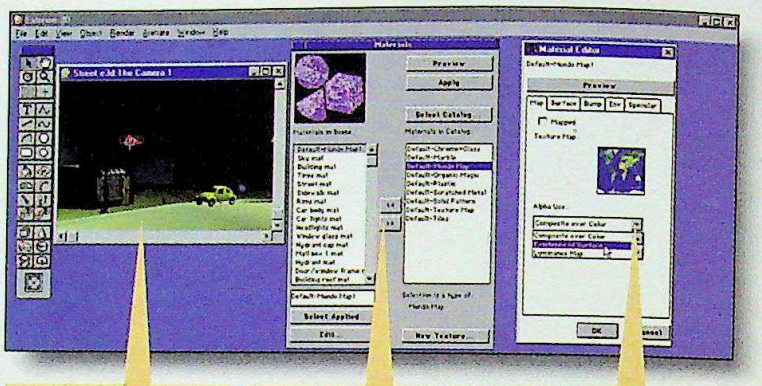
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3-D SOFTWARE

Computing in the Third Dimension: Extreme 3D's Ease vs. Studio Max's Precision

As illustration programs move from the flat sheet into the third dimension, the result is not only a more realistic view of the world but potential confusion as to which 3-D program to use. Macromedia's $699 Extreme 3D and Autodesk's $3,495 3D Studio Max represent two extremes that demonstrate the range of possibilities.

Whereas Extreme 3D places emphasis on economy and ease, Studio Max breaks new ground in terms of depth, flexibility, and precision. Which program you choose to use to build your 3-D world depends as much on how realistic you want it to be as on how much time you're willing to spend constructing it.



The preview of the rendered scene appears quickly but without all the details.

Different materials can be combined in a variety of interesting ways.

The Material Editor lets you cover any object with a texture map.

MANY FACES: *Extreme 3D places a variety of editing screens before the user.*

EXTREME 3D

Macromedia's Extreme 3D starts with a standard set of 3-D tools and an uncomplicated interface and adds customization features, animation, and realistic previews.

All the expected tools (object links, 2-D shapes, and 3-D primitives) are in a vertical toolbar; everything else is accessed through pull-down menus. The program's status bar identifies the current tool and provides helpful technique instructions. The 2-D and 3-D drawing tools are easy to use and standard fare: There are tools for aligning, beveling, filleting, tapering, and trimming. In addition, deformation tools (bend, skew, stretch, taper, and twist) let you push and pull raw shapes. There's even a 3-D Bezier tool that makes easy work of producing compound curves.

Extreme 3D can import .WMF, .EPS, .DXF, FreeHand, or Extreme 3D formats. You'll have to wait until the next version for Macromedia's open plug-in architecture. What you will get is a collection of 36 models and 500 fonts. Third-party developers, such as Acuris and Viewpoint, offer libraries of Extreme 3D models.

Objects in Extreme 3D are defined according to spline and control-point geometries, which allows for powerful and flexible interactions. Beneath that level are the object's defining geometry (such as the circle and length of a column), its surface geometry (spline control points and tangents), and its polymesh geometry (control-point vertices of polygons). Be careful, because you can't undo a geometry change.

With six basic materials and three texture maps, Extreme 3D's Materials Library might seem small, but you can alter and combine materials. For instance, we used the Organic Magic feature to produce a mixture of two plastic-type materials. With Mondo Map, we were able to wrap bitmapped images around objects and define the surface's bumps and reflections. The included Wraptures CD supplies hundreds of textures, environments, and bump maps.

Lighting effects in Extreme 3D include ambient, distant, omnidirectional, and spot. Each of the effects has controls for color, fall-off, dust cone, shadow casting, and intensity.

Everything in a scene can be animated, including material transitions, lights, and shape changes. Animated sequences can be defined and created either interactively in the workspace or by editing the objects and their tracks in the Animation Score dialog box. We were also able to turn any object into another object's path. For example, we made a starburst travel along a string of text while spelling out a name. The biggest shortcoming is the lack of sound tools; you'll need to export the file to add audio.

When it's time to render your 3-D creation, Extreme 3D's Interactive Renderer shows an approximation of your work in progress using Gouraud shading but doesn't render all the details. You can select among various render styles (Bounding Box, Faceted Wireframe, Fast Wireframe, Shaded, Smooth) for each object in a scene, but no object's interactive rendering style can be more complex than the scene's overall setting.

The Final Render to Screen process produces a preview of the scene that includes shadows, lights, dust cones, and such. It automatically uses Gouraud shading for 8-bit color depth and the more detailed Phong shading for 32-bit work. For the sake of speed, Extreme 3D doesn't use ray tracing, which is generally considered more realistic but is slower.

Extreme 3D can speed the rendering process by linking networked computers. But there are limitations: .AVI animation rendering can't be distributed, and in a mixed environment of PCs and Macintoshes can only produce Targa file output, while a Mac-centric network can produce .BMP or Targa files.

Taking 3-D to the Web

Although 3D Studio Max is a robust, full-featured production environment, plug-in technology takes it a step further. Kinetix, for example, is preparing to ship Character Studio, which consists of two plug-ins developed by Unreal Pictures: Biped lets you to move any two-legged character, and Physique lets you animate bulging muscles on your creations.

A brief sampling of third-party plug-ins includes 4Dvision's natural-media painting tools (*http://www.4dvision.com*); Animetix Technologies' conversion routines for game developers working with Microsoft's Direct3D, Sony PlayStation, and Sega Saturn formats (*http://www.animetix.com*); and Sand Blaster, a next-generation particle system from Digimation (*http://www.digimation.com*).

On the downside, all of the IPAS routines developed for 3D Studio Release 4 won't work with Studio Max. Instead, Kinetix offers this plug-in both worlds: It is allowing users to migrate to Studio Max while still maintaining a working version of Release 4 on their systems.—*LS*

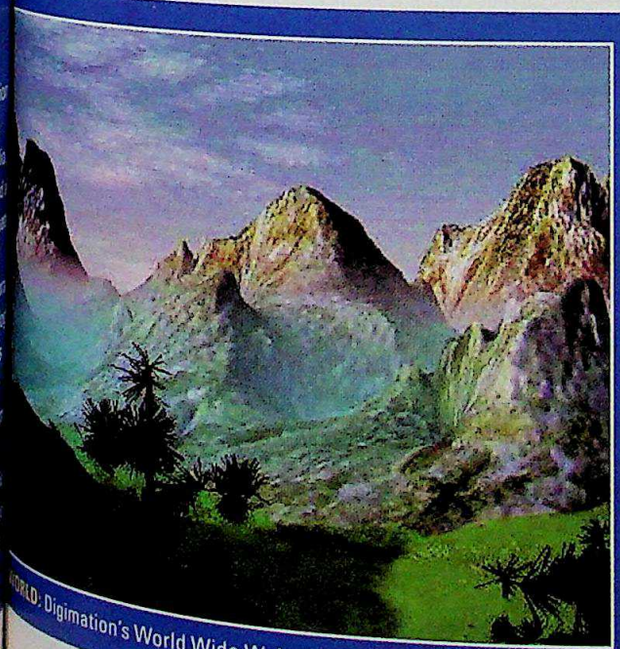
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Extreme 3D is a fast and pow-
program that is certain to
even more versatile in
versions.—*Daniel Grotta*
Cally Wiener Grotta
3D. List price: $699. Re-
16MB RAM, 20MB hard
space, Microsoft Windows 3.1,
95, Windows NT. Macro-
Inc., San Francisco, CA.
partners Macro-
media, New Delhi; Wipro,
lore. Price: Rs 58,500.)

STUDIO MAX

original release of Auto-
's 3D Studio proved that you
use a PC for professional
eling, rendering, and anima-
(First Looks, January 24,
5). Autodesk's recently
med Kinetix subsidiary takes
concept a step or two higher
the 3-D food chain by moving
Studio Max from the DOS
ironment into Windows NT.
Studio Max delivers maximum
formance and control over the
ative process. The program's
graphical interface and inte-
ted environment combine
ctions that were previously in
crete modules (such as the 2D
per, 3D Lofter, 3D Editor, and
framer) into a common work-
ce, which fosters interaction
d synergy among them.
The program has come a long
. For example, creating a table



WORLD: Digimation's World Wide Web site contains may add-ons.

The glass appears as a lathed 3-D object in the rendered view.

setting in 3D Studio required each object to be created individually, followed by the importation of the various elements into the 3D Editor for sizing and positioning. By contrast, Studio Max lets you simply put a localized grid on the tabletop and create bowls, glasses, or plates in position.

The integration of modeling and keyframing operations also means that many core functions can be animated. You can deform an object's shape over time, for instance, using standard geometric modifiers (such as Bend or Twist). All it requires is that you click on the Animate button and create the appropriate keyframes.

Studio Max keeps track of the entire history of each object in an editable file called the Modifier Stack. You can scroll back through the stack at any time and return the object to an earlier state. If you change an object's attribute or parameter, the new values will reflow through all of the subsequent modifications you've made.

For example, we used the Modifier Stack to change the taper of a cone and to reorder the stack commands so that the new object would be twisted before it was bent, not after. Beyond accommodating



The glass appears in the viewport in an editable spline form.

The Modifier Stack lets you move backward through an object's history.

SINGLE FACE: *By pulling all the various elements together in one interface, Studio Max becomes an easier program to understand and use.*

changes of heart, the Modifier Stack lets you move between 2-D and 3-D geometries. Just because you've lofted a 2-D shape into a 3-D object doesn't mean you can't go back and edit the original splines.

You can now push and pull 3-D objects as though they were lumps of clay. Start by defining the surface in Patch Modeling mode by using Bezier curves and a control lattice. Conceptually similar to 2-D curve editing, this process lets you use points and tangent handles to reshape 3-D objects in Studio Max. Then move into Edit Mesh mode, where basic geometry (edge, face, and vertex) is controlled.

Dramatic and realisitc animation effects are possible with new classes of objects. For example, dust, rain, and snow can be generated automatically by using the Particle Systems function. You can adjust the particles for shape, size, and speed. Special effects, such as explosions, waves, and winds, are created with Space Warps. These objects function as force fields that can deform the geometry of objects or influence the behavior of particles.

When you render a scene, you'll find the new Volumetric Light function can produce sunlight streaming through clouds or a campfire's glow. Unlike postproduction filters, which are applied to 2-D rendered images, volumetric lights are based on 3-D data.

Refinements Kinetix made to the Materials Editor mean that the objects themselves can also be rendered with surfaces that are more complex. You can also render different types of maps to the same object (such as bump, diffuse-texture, and opacity maps). For example, we created a double-sided material whose inner and outer faces were rendered with different surfaces.

Although you could always fine-tune the motion of objects in an animation using 3D Studio's time line, Track View, you can now use Out of Range controls to loop the action; Function Curves let you moderate the loop intelligently over time. We created a pair of keyframes that bounced a ball once, repeated the segment ten times, and diminished the bounce until the ball came to rest.

The advanced functions offered by Studio Max are computationally intensive: You'll need at least a fast Pentium processor, 32MB of memory, and a 100MB swap file.

3D Studio Max's network-rendering function now utilizes the TCP/IP protocol. Indeed, as a VRML-compliant tool, Studio Max will work in tandem with a soon-to-be-released sister product, Hyperwire—a visual authoring tool for 3-D Java applications. But the real future of this program lies in the imagination of its users.—*Luisa Simone*

3D Studio Max. List price: $3,495. Requires: 32MB RAM, Microsoft Windows NT 3.51, CD-ROM drive. Kinetix, a division of Autodesk Inc., San Rafael, CA.

(Indian partners HOPE, New Delhi; Neil Automation Technologies, Pune. Price: Rs 60,000.)

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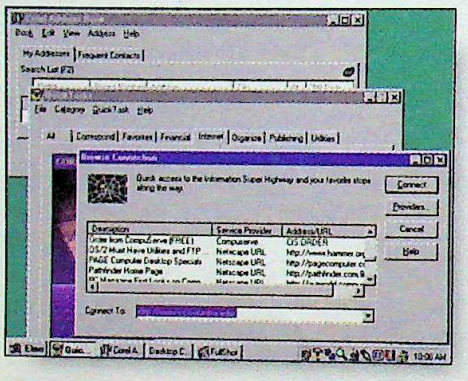
SUITES

Does Corel WordPerfect Suite Leave Office And SmartSuite in the Dust?

By Edward Mendelson

WordPerfect is back, and under Corel's corporate banner, it's well armed to battle against Lotus and Microsoft Corp. in the application-suite arena.

The first 32-bit version of WordPerfect for Windows is the centerpiece of Corel WordPerfect Suite 7, a $449 powerhouse of an application suite that includes vastly improved 32-bit versions of Quattro Pro and Presentations, a unified address book and control center, natural-language help, and a cornucopia of Corel graphics goodies. Despite a few rough edges, the package integrates with Windows 95 better than Microsoft Office does, and it offers more Internet-readiness than Lotus SmartSuite or Office.



INTEGRATED: *You can run Corel WordPerfect Suite 7 from icons on the Taskbar that launch applications, run macros, or browse the Web.*

SUITE DAD

Holding the suite together is the new Desktop Applications Director (DAD), which sits in the Windows 95 system tray and doesn't take screen space away from applications. A range of supplied QuickTask macros operate across the entire suite and let you create World Wide Web sites, track stocks, consolidate expense reports, or perform any one of two dozen complex tasks.

You can create your own tasks in the suite's shared macro language—a feature that's still not available in Office or SmartSuite. A Software Developers Kit for macros comes on the program's CD-ROM. Other DAD features include quick access to favorite Web sites, and WordPerfect Suite installs your Netscape Navigator bookmark page by default. If you don't have Navigator, the suite can install it as well as a copy of AT&T WorldNet Service.

WordPerfect 7 uses the Version 6.*x* file format and won't require retraining to master. New features that fit neatly into the earlier menu structure include an Internet publisher that walks you through the steps needed to create an HTML file, converts the current document into HTML, or converts an HTML file into WordPerfect format.

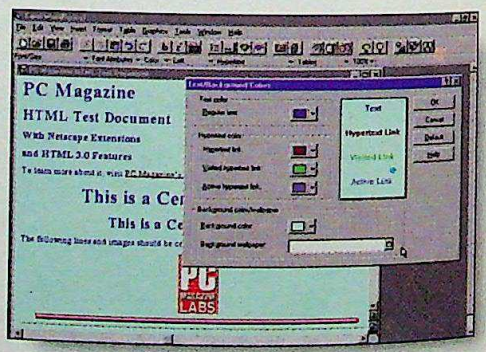
To create a link from your word processing file to a Web page, simply display the page in Navigator and press a few keys in WordPerfect. Your pages can include such HTML 2.0 features as tables, but there are no tools for creating an HTML form. You can import graphics from virtually any bitmapped or vector format or scan them in directly from any Twain-compatible scanner; all are transparently converted into .GIF or JPEG formats.

New convenience features include an optional hot spot next to the current graphic, paragraph, or table with appropriate formatting options so you don't have to dig through multiple menus. Optional gridlines help make sense of tables and columns, and a new tab-setting icon lets you see exactly where you've inserted new tab rulers. While you move through a document with the mouse, a gray shadow pointer shows where the cursor will move next, but you'll have to wait for a future release if you want to turn off this feature.

Spell-checking optionally occurs on the fly, and the spell-check dialog box is now a separate panel at the foot of the screen instead of a box that floats annoyingly over your text. Annotations are color-coded to indicate which reviewer created them. As in Microsoft Word, you can use the Tab key to indent a paragraph.

WordPerfect retains its high-end lead and is still the only word processor that can double as a credible desktop publishing package, complete with an option to wrap text around irregular graphics. The style and outline features remain needlessly confusing, and you still can't customize the bullets-and-numbers styles. The archaic code-based equation editor hasn't changed. Some features, such as the ability to record a macro that pauses for input, were dropped.

WordPerfect's available tables include 100 spreadsheet functions, default styles, and automated quick formatting and can now include diagonal lines through one or more cells; cells can be rotated in 90-degree increments. For serious spreadsheet functions, Quattro Pro 7 now includes a dazzling Formula Composer that displays equations in a tree-structured form for quick debug...



WEB PUBLISHER: *WordPerfect Suite 7 edits HTML files in WYSIWYG view with easy access to formatting options.*

Data manipulation remains ... awkward than in Microsoft ... or Lotus 1-2-3, but ... tures are now included, ... can reference Internet ...

The Presentations ... shares much of its code ... graphics features in the rest ... suite. You can use the latest ... net graphics, such as the ... Network Graphics format, ... program includes dozens of ... tions and animation ...

SINGLE ADDRESS BOOK

The suite integrates the ... address books for envelopes ... templates into a single ... entity that lets you organize ... contacts in tabbed multiple ... lets. Envoy, an electronic ... ment package, is accessible ... menus throughout the ... you can publish files for ... the standalone Envoy ... the Envoy plug-in for ...

Also tossed into the ... CorelFlow, Dashboard, and ... kick, although none are ... ed. The included copy of ... QuickView Plus will ... most useful; its file-viewing ... ties integrate with the ... 95 Explorer and many ... plications. In June, Corel ... the $695 Office ... package, which ... the database ... 7, the PIM ... tral 7, and a ... cense and ... from GroupWise ... drawing module ... CorelDraw ... place CorelFlow. ... Under Corel's ... ship, ... again has a ... Corel ... Suite 7 is an ... and encouraging ... beginning.

Corel WordPerfect Suite 7 ... $449 (upgrade $129). ... 8MB RAM, 80MB hard ... Microsoft Windows 95. ... Corp., Ottawa, Ontario, ... *(Indian partners, ... Infoworld, Pune; ... Delhi; Wipro, Bangalore. ... Rs 29,198.)*

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DIGITAL PHOTOGRAPHY

Polaroid's PDC-2000 Takes Sharp Digital Pictures—with Some Effort

Daniel Grotta and Wiener Grotta

Polaroid Corp.'s $3,695 PDC-2000/40 is a sleek, slim, well-built digital camera that looks like a spaceship, acts like a 1960s 8-millimeter (film) movie camera, and exploits the state of the art for filmless photography, but it can be awkward to use.

On the front of the camera are the lens, viewfinder, strobe flash, and auto-focus sensor. Although horizontal shooting felt comfortable and natural, shooting in the vertical mode required holding the camera in what felt like an upside-down position, because the viewfinder is below and to the right of the lens. That's so the flash will be above and not below the lens. In addition, the camera's control buttons are awkwardly placed and can be confusing to use.

The PDC-2000's thumbnail-size charge-coupled device (CCD) target contains 1 million horizontal pixels to help eliminate color aliasing. When the RGB color channels are saved as an image file, however, the pixels become square, and the image is therefore sharper than other digital cameras'. And to improve fast transmission, Polaroid opted for pastel rather than solid-color RGB filters. The camera has an ASA rating equivalent to a film speed of 100.

The net effect is an uncompressed file size of 1MB—40 times as much raw data as images from the Casio QV-10 can have the choice of either storing a photo as a 1.44MB 800-by-600-pixel file or interpolating into a 5.76MB 1,600- by 1,200-pixel file.

For optimum exposure and color balance, the user can select the type of lighting (daylight, incandescent, or fluorescent), choose the flash mode (full, fill, or no flash), and even compensate for backlighting. But there is no general exposure-compensation feature. And though the flash carries up to 15 feet, it doesn't have a preflash exposure to eliminate "red eye" and tends to overexpose subjects closer than 6 feet. The biggest disappointment was the lack of a connector for attaching auxiliary or studio strobes.

There's a simple labeling system for annotating each image with up to ten alphanumeric characters. Although this works reasonably well, there's no provision for interfacing with a PC or PDA to download a shooting session's details.

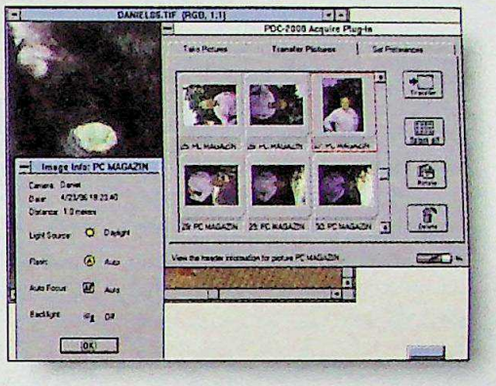
Polaroid claims that the PDC-2000's SCSI-2 interface can transfer 800- by 600-pixel images in as little as 6 seconds and 1,600- by 1,200-pixel images in 9 seconds. On our 486DX2/66 test system with 16MB of memory, we were able to acquire 800- by 600-pixel images in about 44 seconds; it took 5 minutes 9 seconds to transfer a 1,600- by 1,200-pixel image.

The weak link is Polaroid's Twain interface, which lacks any image-editing or -correction tools, except for an instant-rotation feature. You can elect to capture one, several, or all images to the screen or to disk (but not to both simultaneously) at either resolution.

One particularly valuable feature for users who need to shoot a series of images from a stationary position is the ability to display real-time black-and-white preview images from the camera to the computer monitor. When the subject is ready, you take the picture by clicking your mouse. Our test computer updated the display approximately every 2 seconds.

Several unfortunate engineering decisions mar the PDC-2000's design. One was using sonar rather than infrared auto-focus. The sonar sensor focuses on the largest object in the middle of the viewfinder. If you want a specific part of the picture to be sharp, you must first frame your subject in the middle, press the shutter button halfway to lock the focus, and then move the camera to the picture-taking position. In addition, focusing is done by adjusting the position of the CCD—not the lens—and the camera's stepper has 50 preset positions.

Rather than use through-the-lens viewing, Polaroid opted for a mediocre optical viewfinder with neither parallax correction nor a macro indicator. The battery compartment's door can pop off easily, spilling the four rechargeable AA batteries. The 11-mm lens has a fixed focal length and no zoom, and the only interchangeable lens available is a $199 17-mm portrait lens.

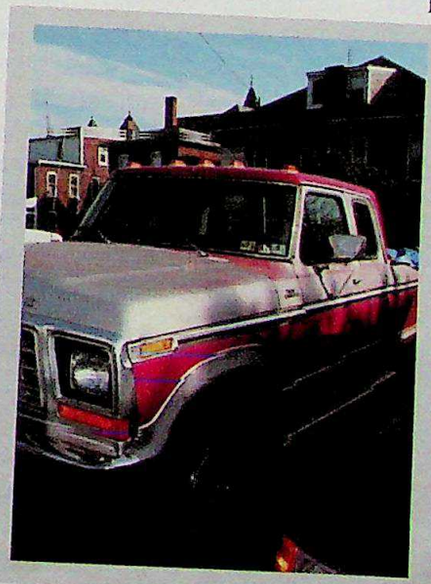


SPIN, SPIN, SPIN: *The PDC-2000's interface lacks basic image-editing or -correction tools, but it allows you to rotate images.*

The PDC-2000 doesn't give users any way to set aperture and shutter speed manually or any choice of metering and focusing modes. There's no PC Card slot, so all images are stored internally. Once the 40MB hard disk is filled, the images must be uploaded to a computer before the next shot.

Despite the PDC-2000's shortcomings, its digital photos were sharp, with vivid colors that reproduced a tonal range rich with detail. In fact, they are among the best-looking images produced by the filmless cameras under $23,000 that we've tested.

Polaroid PDC-2000/40. List price: $3,695. Requires: 8MB RAM (16MB recommended), DOS 5.0 or higher, Microsoft Windows 3.1 or later, ASPI-compliant SCSI adapter. Polaroid Corp., Cambridge, MA. *(Indian subsidiary Polaroid India, New Delhi; partner DCM-DS, New Delhi. Price : Rs 208,000.)*





EARTH TO POLAROID: *The Polaroid PDC-2000 might resemble a spaceship, but it takes sharp and colorful photographs.*

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WINDOWS 95 UTILITIES

Two New Takes on File Compression for Windows 95

By Barry Simon

Drag and File Gold 2.0 and WinZip 6.1 are both compression and file management utilities, but each takes a different approach to the Windows 95 environment. Canyon Software's $55 Drag and File Gold 2.0 combines the familiar File Manager interface with Windows 95 features. Nico Mak Computing's $29 WinZip employs wizards and automates many of the tasks associated with file compression.

DRAG AND FILE GOLD 2.0

Drag and File Gold 2.0 will appeal to those fond of the Windows 3.1 File Manager, as well as those who have to manage a lot of compressed files. Drag and File supports long filenames and takes advantage of many of the other features of the Windows 95 Explorer. For example, if you right-click on a filename in a Drag and File window, you get the full context menu for the correct file type.

Drag and File displays .ZIP files, as well as the Internet-centric .TAR and .GZ files, as folders in the tree portion of the program's window.

The program contains a drive bar that displays icons for each drive, a DOS command-line version (a special version of Smiler Shell), and a virus checker from Stiller Software. After we reviewed Version 2.0, Canyon Software released Version 2.2, which adds an "Explorer View" option for displaying all the volumes and folders in the program's tree view.

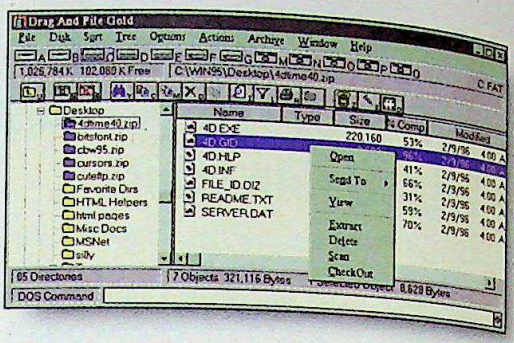
WINZIP 6.1

WinZip has a reputation as the slickest and easiest to use of all the Windows 95 .ZIP file management utilities. With its WinZip wizard, Version 6.1 brings WinZip simplicity to a new level.

During installation, WinZip adds any directory with "download" in its name and, optionally, directories with .ZIP files to its Favorites list, so just about any file you recently downloaded is likely to be included. The files are displayed by date modified, with the most recent ones at the top.

The WinZip wizard will then unzip the file to a new directory, and if there is a SETUP.EXE or INSTALL.EXE file, WinZip automatically runs it. The program can be configured to run the wizard whenever you double-click on a .ZIP file, so that downloading and installing programs inside .ZIP files becomes effortless. Though there is no wizard for creating .ZIP files, a tutorial helps users with file compression.

Version 6.1 retains WinZip's tried-and-true interface and adds some minor enhancements and an "Open with WinZip" command to context menus for self-extracting .EXEs.



FILE MANAGER PLUS: *Drag and File Gold lets you manage and view archived files.*

With Version [illegible] WinZip cre[illegible] to be a mu[illegible] utility for all [illegible] **Drag and File 2.0.** List price: [illegible] Requires: [illegible] RAM, 2MB [illegible] disk space, [illegible] crosoft Win[illegible] 95. Canyon [illegible] ware, San Rafael, CA. *(No Indian partner.)*

WinZip 6.1. List price: $2[illegible] quires: 4MB RAM, Mic[illegible] Windows 3.1, Windows 95, [illegible] dows NT. Nico Mak Comp[illegible] Inc., Bristol, CT. *(No Indian Partner.)*

CONTACT MANAGEMENT SOFTWARE

Maximizer 3.0is: Flexible, Competent Contact Management

By Kathy Yakal

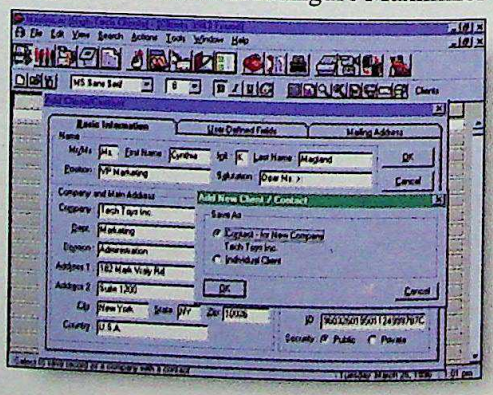
The $149 MultiActive Maximizer 3.0is for Windows 95 retains the look and feel of one of the oldest and most popular contact managers but adds new Internet hooks. (The "is" stands for "Internet-savvy.")

Maximizer 3.0is runs under Windows 3.*x*, Windows 95, or Windows NT. Maximizer's popularity is based largely on the program's flexible approach to handling contacts. For example, you can set up core records for clients (companies or other organizations) and link an unlimited number of individuals (contacts) to them.

A tabbed file holds all the fields you'll need, including multiple address fields. You can also set up an unlimited number of user-defined fields (UDFs) containing table, alphanumeric, date, or numeric data or any combination. UDFs can use customized drop-down lists, and they are searchable. Some are predefined.

Maximizer 3.0is' calendar and task management capabilities match those of the best contact managers. You can attach scheduled items and to-do lists to contacts or assign them to your personal hotlist, prioritize tasks, and find time for scheduling one-time or recurring events.

You can configure Maximizer 3.0is to enter such events as phone calls. And when you've completed an activity, Maximizer 3.0is asks if you want to schedule a follow-up.



MAXIMUM FLEXIBILITY: *Maximizer 3.0is lets you add multiple contacts to a company.*

Billed as the first Internet [illegible] tact manager, Maximizer 3.[illegible] lows you to tap into the [illegible] Eagle database to find and [illegible] load information on new [illegible] tacts. The database, which [illegible] accessed at *http://www.max[illegible] er.com*, contains information [illegible] 10 million businesses, supplie[illegible] American Business Informa[illegible] You can search the records b[illegible] dress, area code, name, n[illegible] of employees, or ZIP code [illegible] then download the results di[illegible] ly into Maximizer 3.0is.

Although you can tile mu[illegible] windows to view several aspec[illegible] a contact's information simu[illegible] ously, this feature doesn't w[illegible] very well. On the whole, Maxi[illegible] er 3.0is's performance on com[illegible] contact management tasks [illegible] fine, though databases did [illegible] seem to load very quickly.

Maximizer 3.0is adds signifi[illegible] new functionality that will p[illegible] especially useful for SOHO u[illegible] without sacrificing any flexi[illegible] ty—all at a competitive price. **MultiActive Maximizer 3.0is for Windows 95.** Estimated street price: $149. Requires: 8MB RAM, 10MB hard disk space, Micro[illegible] Windows 3.*x*, Windows 95, Wi[illegible] dows NT. Maximizer Techno[illegible] gies, Vancouver, British Colu[illegible] bia, Canada. *(No Indian partner.)*

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MULTIMEDIA SOFTWARE

Databank Introduces 3D Graphics & Animation Package from Asymetrix

Until now, working in 3D meant spending a fortune on complicated software, spending days learning the nuances of 3D design and animation, and then spending even more time actually generating 3D images and animations. Madras-based Databank Systems, the authorized distributor of Asymetrix products in the country, has introduced Asymetrix 3D F/X, a software package for creating professional grade 3D images and animations.



Using Asymetrix 3D F/X, the user can create eye-catching 3D images and logos for interactive learning programs, presentations, printed documents, CD-ROMs, desktop video, information kiosks, and other applications that can incorporate bitmaps and digital video images.

With Asymetrix 3D F/X, the user can instantly preview 3D images and animations. Color, surface, and transparency of the object can be analyzed, and true intersections between objects can be viewed. Pre-set or custom animation paths for any model can be previewed. Solid model preview eliminates guesswork, so that the user can know for certain what the final output will look like.

The drag-and-drop interface of Asymetrix 3D F/X permits the user to quickly create 3D scenes simply by combining and modifying pre-set scene elements.

To start, the user can choose from a collection of professionally designed scenes, and then use the selected scene immediately, or customize it.

To add additional scene elements like backdrops, lighting, and other elements, the user can take recourse to the Asymetrix 3D F/X clip art catalog.

3D models can be dragged and dropped onto the scene. The user can select from an entire catalog of models and shapes, or create his own 3D text using any TrueType font.

Asymetrix 3D F/X makes creating elaborate animations remarkably simple. The user can spin, rotate, and move models and text in and out of the scene by simply dragging and dropping pre-set or customized animation paths.

The user can even show a digital video file playing on a model's surface. For more effect, the user can apply an audio (.WAV) file to the animations.

The user can get started with 3D rightaway, because Asymetrix 3D F/X comes with a vast collection of models and 3D scene elements. Scene elements can be located in the catalog using a unique visual browser. The compilation includes sample starter scenes, 3D models, surfaces, pre-set animation paths, scene lighting, and backdrops.

The user can take advantage of complete Microsoft Office compatibility. By using OLE 2.0, Asymetrix 3D F/X graphics can be embedded into existing Windows applications.

Files may be exported in a variety of formats, and the user can output high-quality animations for use in other applications.

Asymetrix 3D F/X. *Databank Systems, 3A Anand Apartments, J.P. Avenue, Dr Radhakrishna Sales, Madras 600004. Tel: 8273850; Fax: 8240464.*

MULTIMEDIA ACCELERATOR

Streamlining Graphics, Animation, And Video Playback for PCs

Madras-based Diamond Multimedia Systems, a company specializing in the design, sale, and support of PC and Mac multimedia solutions, has introduced a retail version of its Stealth 3D 2000XL multimedia accelerator. The product is designed for business and entertainment multimedia applications, and is a single 2 MB PCI add-on sub-system that delivers 2D graphics, 3D animation, and MPEG-1 (motion pictures expert group) digital video playback acceleration for PCs running Windows 95, Windows NT 3.51, and DOS.

Stealth 3D 2000XL is bundled with two games optimized for 3D hardware acceleration. These are Interplay's 'Descent and 'Destination Quartzon' and Sony Psygnosis' popular PlayStation and PC title 'Destruction Derby'. Compton's interactive encyclopedia 1996 from Compton's New Media is also included, demonstrating the product's graphics quality and video playback capabilities.

Configured with 2 MB single-cycle fast magic RAM for the PCI bus, the Stealth 3D 2000XL accelerator features ultra-fast 2D graphics performance. It consistently performs at the same or better levels as higher priced WRAM accelerators. When tested with industry-standard benchmarks, the accelerator scored 29.0 in Winbench 96 and 65.3 in Winstone 96.

Stealth 3D 2000XL provides 256 colors at resolutions up to 1600 x 1200 as well as 16.7 million colors at resolutions as high as 800 x 600. The maximum refresh rate is 120 MHz. The high resolutions, color depths, and overall graphics speed improve the performance and visual quality of business applications and entertainment software.

The 3D engine provides a variety of special effects: perspective-corrected texture mapping, bi-linear filtering, alpha-bending, depth cuing and fogging, and so on. Z-buffer memory is also utilized to speed up the removal of hidden surfaces, so that objects appear life-like without compromising 3D performance. Stealth 3D 2000XL supports a wide range of DOS and Windows games and applications. Additionally, Diamond is partnering with S3 to provide software companies with the tools needed to develop interactive 3D applications designed to take advantage of the special 3D features of the Virge technology on Stealth 3D 2000XL.

For playback of digital video clips and entertainment titles, the accelerator supports a speed of up to 30 frames per second. Video functions include image scaling and color space conversion. Images can be scaled up to full-screen without compromising on quality or playback speed.

Stealth 3D 2000XL is software upgradable to future technologies including direct 3D support, Diamond GT drivers, and InControl tools 95.

Stealth 3D 2000XL. *Spectra Innovations India, S622 Manipal Center, 47 Dickenson Road, Bangalore 560042. Tel: 5588323; Fax: 5586872.*

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NETWORK MANAGEMENT

ManageWise to Support Cross-Platform Management Services

US-based Novell, a leader in networking software, has announced a new version of ManageWise, the company's well-known end-to-end network management solution. The enhanced version enables the management of heterogeneous server environments, and supports a combination of remote control, hardware and software inventory, virus detection, file transfer, and configuration change management capabilities with networked desktops.

The latest version—ManageWise 2.1—comes with a new ManageWise agent for Windows NT server to permit the management of mixed NetWare/Windows NT networks. ManageWise 2.1 also adds support for Windows 95 and OS/2 Warp clients, enabling network administrators to manage all major client/server systems within their PC Lans from a single management console.

Novell also outlined its software management solution to address software access, control, and deployment out to the networked desktop. These enhancements make the ManageWise product family the most comprehensive integrated management solution for heterogeneous PC network environments.

The ManageWise agent for Windows NT server integrates with ManageWise 2.1 to provide a standards-based solution to regulate server performance, detect fault conditions, and monitor Windows NT server configurations. Information systems managers can use a single ManageWise 2.1 GUI to manage both NetWare and Windows NT servers, eliminating the need to learn two separate network management systems. ManageWise communicates both NetWare and Windows NT server management information via the industry-standard simple network management protocol (SNMP), allowing enterprise administrators to manage their PC Lan environment from their enterprise console. ManageWise is also optimized to work over phone lines to deliver NetWare and Windows NT management information remotely in a proactive manner.

The Windows NT server agent extends the capabilities of ManageWise 2.1, enabling administrators to proactively manage NT servers by collecting real-time and long-term performance trends and alarm information for an instantaneous understanding of unusual conditions and changing environments. It provides monitoring of all useful server statistics, including disk I/O, memory, CPU utilization, loaded software, network adapters, and print queues to help network managers prevent d... time. NT servers are ... tomatically discovered ... placed in the ManageWise ... pology map so that admin... tors can effectively document ... troubleshoot their heterogen... PC networks.

As part of the Manage... product family, Novell pro... NetWare Application Lau... which enables administra... control the client company's ... ware assets, while offering ... users the freedom of acce... software from anywhere on ... corporate networks. Net... Application Launcher allow... network administrator to p... cally distribute software o... the desktop through auto... installations.

ManageWise 2.1. *Ov... Novell Software India, Ma... Bhavan, Saki Vihar R... Bombay 400072. Tel: 835... Fax: 8214203.*

COLOR MONITOR

Aditya Launches Goldstar Monitor

Aditya Promoters, the Indian partners of LG Electronics of South Korea, has launched Goldstar 1467, a non-interlaced 14" SVGA color monitor in India. The new model delivers the kind of performance required by graphics-intensive applications, and is compatible with a wide variety of graphic controllers. It features specially designed picture tubes, ultra-high resolution performance, and an energy-efficient chassis.

The color monitor's 0.28 mm dot pitch and multi-synchronous compatibility features with a wide range of video controllers from VGA to VESA-extended 1024 x 768 non-interlaced at 6Hz refresh rate, gives it an edge over its competitors. Its anti-static coating conducts away the electric charge and prevents dust from adhering to the surface. It offers lower operating costs and conforms to most international safety and regulatory certifications.

The monitor has a detachable swivel base that allows for optional placement and positioning in any environment. Its high horizontal and vertical scanning frequencies, coupled with a video bandwidth of 65 MHz provides for flicker-free, bright, and vivid images. It has a full-screen monitor and supports unlimited colors. Goldstar 1467 has a wide range of user-friendly controls on its front panel, along with display power management signalling for reduced power consumption. As interlaced monitors have now become more or less obsolete, Goldstar has dropped all its interlaced models, and has completely switched over to non-interlaced monitors. Aditya will market Goldstar non-interlaced SVGA color monitors in 14", 15", 17", and 20" sizes along with Goldstar Studioworks multimedia monitors in 14", 15", and 17" sizes.

Goldstar 1467 is priced at Rs 13,750 (exclusive of taxes and government levies).

Goldstar 1467. *Aditya Promoters, Khemka Center, 2-5 Nehru Place, New Delhi 110019. Tel: 6223810; Fax: 6227979.*

MUSIC LIBRARY

Corel Releases Stock Music Library

Canada-based Corel Corporation has released Corel Stock Music Library, an addition to the Corel CD Home line of products. The 10 CD-ROMs in the library contain a diversified mix of royalty-free sound clips with 352 minutes of original melodies in CD Audio and WAV file formats. There are 21 different musical categories ranging from corporate to classical, and rhythm and blues to ambient. The library also contains 103 individual tunes. It offers an inexpensive way of adding music clips to presentations, multimedia titles, and demonstrations.



The library has been developed for Corel by Leopold Music. It runs on all operating systems including Windows 3.1, Windows 95, Windows NT, Macintosh, OS/2, and Unix. Each music clip offers three lengths—10 seconds, 30 seconds, and two minutes.

Leopold Music is an audio production company run by Andres del Castillo, who has been composing music for 15 years. Among Leopold's ... rate clients are the Ottawa S... ators, Telesat, the United ... tions, and several television ... radio broadcasters.

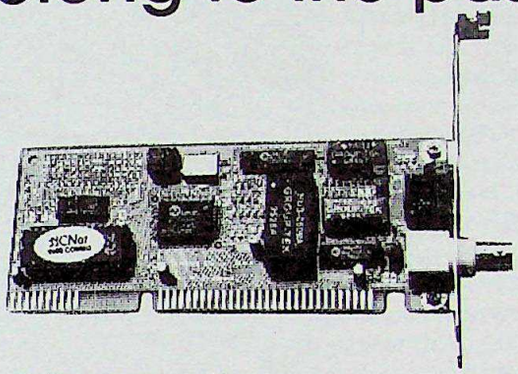
This more or less ... stock music library will come ... a boon to multimedia and ... sentation professionals.

Corel Stock Music Libra... *Svam Software, 70 Jang... New Delhi 110001. ... 3326313; Fax: 91-11-372...*

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belong to the future ....
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HOME PC

Apple Launches Multimedia PowerPC System for Home Users

US-based Apple Computer has introduced a powerful home and home office multimedia computer—Macintosh Performa 6300CD—in India. The Performa 6300CD system is a powerful solution for the home market, offering unprecedented performance and enhanced multimedia capability.

Combining the high performance of Power PC technology with advanced multimedia capabilities, the Macintosh Performa 6300CD system brings new capabilities and options to home and home office computer users.

The salient features of the system include a high-performance 100 MHz Power PC 603e microprocessor with a built-in 256 K Level-2 cache; a quad-speed CD-ROM drive that provides access to video, stereo music, narration, graphics, and animation clips available on CD-ROMs; a 15" color monitor with built-in stereo speakers for high-quality audio playback; 16 MB of standard memory, enabling the user to run several applications simultaneously; and a 1.2 GB hard drive to store sophisticated applications and media-rich information.

A combination of these powerful features gives home users a computer that easily handles any task, from creating a multimedia presentation to balancing the passbook, to managing household expenditure. The Macintosh Performa 6300CD will initially be available at an estimated retail price of Rs 0.12 million from all authorized Apple dealers.

Apple's specialty multimedia solutions—the Apple video system, video/TV system, presentation system, and Motion Picture Experts Group (MPEG) media system—work with the Macintosh Performa 6300CD system. These solutions allow customers to capture video from either a television, VCR tape, or directly from a camcorder, with a single button, The Apple MPEG media system pro... full-motion, full-screen vide... the computer.

The powerful new fea... of the Performa 6300CD s... extend the foundation co... to all Performa systems—... Mac OS, plug-and-play ha... optimized for multimedia ap... cations, a selection of pre... stalled productivity, educa... and entertainment software, ... a variety of CD-ROM titles f... Apple and third-party deve... ers.

Apple Performa 6300CD. *...ple Computer International, ... Floor Du Parc Trinity, M... Road, Bangalore. Tel: 5550... 74; Fax: 5550660.*

APPLETS FOR NOTES

Lotus Announces Software Applets

Lotus Development Corporation, a subsidiary of IBM Corporation, has launched Lotus Components, a set of fast, focused software applets for Lotus Notes. The company also revealed a series of aggressive programmes designed to fuel trial and deployment of its new product.

Lotus Components are a set of small, task-focused software applets that extend the capabilities of Lotus Notes Release 4.1. The initial product set, the Lotus Components Starter Pack, will include applets for charting, drawing and diagramming, file viewing, project scheduling, and performing spreadsheet calculations.

To use Lotus Components, users select the component applet they need from within the Notes desktop via the Lotus Components palette. The user stays in the familiar Notes environment, using context-sensitive menus, the InfoBox, SmartIcons, and the status bar. When a user receives a Notes document with a Lotus component, the applet is quickly activated and the document opened with a single click.

For Notes application developers, Lotus Components extend the application potential of Notes. The properties and methods of each Lotus component are exposed to Lotus application developers to control Lotus Components within their Notes applications. All Lotus components are Note/FX-enabled, allowing bi-directional communication with Notes. The Lotus Component Starter Pack also includes the Lotus Components Template Builder to customize components and further extend Notes applications.

For ActiveX/OCX developers, the Lotus Component Software Developers' Kit (SDK) provides tools and specifications to enhance standard OCX components into Lotus Components, which are optimized to work with Lotus Notes.

Lotus Components, because they are based on ActiveX/OCX technology, run on Microsoft Win32 operating systems—Windows 95 and Windows NT workstations. The applets will make it easy for Lotus Notes users to perform operations liks charting.

Lotus Components. *Lotus Development Corporation, India Liaison Office, 501 Bhikaji Cama Bhawan, Bhikaji Cama Place, New Delhi 110066. Tel: 6168140/6182541; Fax: 6182543.*

RAM-ENHANCING SOFTWARE

Software That Doubles RAM

Mumbai-based MicroWorld, a software development company specializing in system software and networking, has introduced RAMplifier, a RAM-multiplying software that works on Windows & Windows 95 operating systems.

It requires a 386 or above processor-based PC with at least 4 MB of RAM and either the Window 3.x software or the Windows 95 operating system, with 1 MB of hard disk space.

RAMplifier multiplies memory by using high-performance compression techniques. Unlike other RAM-doubling packages, where a single level of compression takes place, RAMplifier has three pyramid levels of compression. These are Level-I RAM compression (LC-I), Level-II RAM compression (LC-II), and high-performance virtual memory compression (HP-VMC).

Levels I and II act on the system RAM, while HP-VMC acts on Windows-created swap files. The compressions are done by special RAMplifier virtual device drivers (VDDs) that get loaded before Windows actually starts.

Compression levels are decided dynamically at run-time. This greatly speeds up the compression performance ... RAMplifier. For example, ... PC has 4 MB of RAM, LC-I ... activated when the full 4 M... occupied by Windows, LC... gets activated when the ne... MB (created by LC-I) is full ... finally, HP-VMC compres... takes charge after LC-I and ... II memory is used up fully.

RAMplifier also dynami... ly defragments the memory ... out of 4 MB of RAM, 2 M... free, Windows will be ab... allocate the full free 2 MB ... application only if the avail... 2 MB is contiguous.

If not, Windows will fa... allocate memory. RAMpli... collects all the free memory ... es available and bunches th... together. This means that ev... byte of the PC's memory is u... optimally.

The 1-MB optimizer opti... es the lower 1 MB of RAM. T... optimizer moves memory ... cated in the lower 1 MB regi... extended memory so that ... conventional RAM is avail... to Windows. The package co... Rs 2,250.

RAMplifier. *Microwor... Godawala Shop No. ... Shradhanand Ext. Road, ... Parle (E), Mumbai 400057. T... 6147896; Fax: 6180842.*

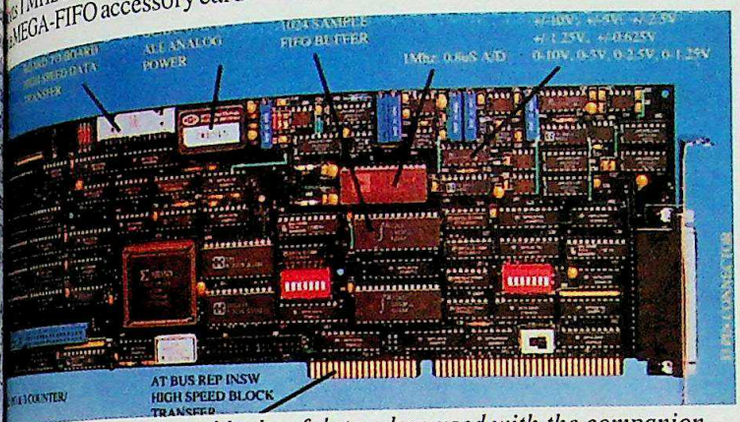
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ANALOG INPUT CARD

Computer Boards Releases High-Speed Card for Bulk Data Transfer

S-based Computer Boards has released CIO-DAS16/M1, a high speed, 8 channel, MHz analog input card. It supports 1 MHz of continuous input MEGA-FIFO accessory card



S16/M1: *Can transfer huge blocks of data when used with the companion A-FIFO board.*

rough DT-CONNECT, pre-ger buffers of unlimited size, 6-step programmable chan-gain queue, 24 lines of tal 1/0, and three 16-bit nters.

Augmenting the powerful mega samples of sampling data can be stored at top speed. The DT-CONNECT feature enables large blocks of data to be transferred to the sampling buffer card at the full speed of the board. Users of windows application software will want this superb feature as sample transfers occasion no delays in concurrent programs.

A precise 12-bit analog-to-digital converter transforms high-speed analog signals into their digital representation. This 1 MHz A/D converter resolves the data to an accurate 1 part in 4095. Without the MEGA-FIFO, acquisition speeds of 800 KHz to system memory are attainable through use of the REPINSW command and the on-board 1K FIFO.

Analog input ranges are software programmable. The unique programming flexibility of the 256-byte channel gain queue allows analog inputs to be sampled at different ranges on different channels.

Twenty four lines of digital 1/0 and three 16-bit counters are accessible through a 50-pin dual in-line connector on the rear of the card. The 1/0 lines may be used for relay closure to turn on motors and valves, or latch signals into an analog input channel of the card. The precision counters support sample pacing or event counting.

The C10-DAS16/M1 uses a standard 37-pin connector which is compatible with the original DAS-16. This makes the speed of sampling upgrades convenient and easy, as there is no need to change the existing wiring to sensors. Performance is enhanced by merely replacing the older DAS-16 board with the C10-DAS16/M1.

InstaCal, a software package which installs, calibrates, and tests all Computer Boards cards, is provided free with the card

C10-DAS16/M1. *Concept Electronics, 209, 28th Cross, 7th Block, Jayanagar, Bangalore 560082. Tel: 6637935; Fax: 6656468.*

GAME

Corel Releases CD-ROM Title for Kids

anada-based Corel Corporation, a world leader in graphics software, has begun ship-*The Bungalo Boys: The Big Wish*, a multimedia CD-M title based on the popular ngalo Boys book series. This eractive story is targeted at ngsters aged up to 10.

The Bungalo Boys: The Big sh Wish has excellent enter-ment value for children. The hing segments alone, which uire some skill to master, ll entertain them for hours," s Dr Michael Cowpland, pres-nt and CEO, Corel Corpora-n.

The Big Fish Wish is a tale of o cousins, Shorty and Carlotta, o venture out one day to catch ir first fish with the older ngalos—Johnny, Bob, and rly. Children are able to join this adventure through simu-tion, which allows them to cast their line and haul out their ch in one of five different fish-holes. The ultimate goal is to reel in Mighty Millie, the biggest, meanest muskie on earth. Children also get a chance to jump into the driver's seat. By using the left, forward, and back arrows, they can drive a pick-up truck with a boat in tow, down to the dock and practice launching the boat.

This fun-filled and educational CD-ROM contains over 240 animations, 21 narrated story book pages, and eight interactive story book pages with more than 10 spots per page. Children may also record their voice for playback during the narration, and a paint program offers 12 different story pages to color. At any time, children can click on Old Rufus Bungalo to hear the narration again, or click on the swimming dog to return to the main menu.

The Bungalo Boys: The Big Fish Wish. *Svam Software, 70 Janpath, New Delhi 110001. Tel: 3326313; Fax: 91-11-3723266.*

REMOTE CONNECTIVITY DEVICES

D-link Announces netXpand

D-Link has announces the netXpand series, which combines remote access server, routing, and bridging functions for workgroups and departmental network links. It offers high-performance, cost-effective devices, ideal for businesses needing low-cost, low maintenance solutions for clients, LAN, and LAN-to-WAN connections.

The WAN ports support connections to analog telephone line ISDN BRI services, switched-56 lines, and T1/E1 leased-lines. Standard PPP and multi-link PPP are provided for WAN interoperability.

D-Link netXpand routes IP and IPX packets while bridging other protocols. Optional software provides firewall filtering, allowing connection of Web servers on affordable intranets.

D-Link Standard PCMCIA interface is used to support high-speed modem cards and ISDN cards. External analog modems and ISDN terminal adapters, switched-56 lines and leased lines are also supported via serial ports.

PAP, CHAP and restricted callback are provided for access security. Users can also track network log-ons to monitor and record who has accessed the network.

Other features of the netXpand series include compatibility with Windows 95, Windows NT, Chemeleon Desktop, and Netscape; compatibility with high-end internetworking devices; bandwidth on demand; easy installation; and SNMP management. The products in the series include D-link DI-1181: Remote Connection for Small Business, D-Link DI-1184: Remote Connection for Workgroups, D-Link DI-1180: Central-site Remote Connectivity, and D-Link DI-1184.

netXpand. *D-Link, Plot No. 5, Kurla Bandra Complex Road, Off. CST Road, Santacruz (E), Bombay 400098. Tel: 6172478.*

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WINDOWS-UNIX PRINT SHARER

Product That Extents Windows File & Print Sharing to the Unix Environment

SCO, the world's leading provider of Unix server and host systems, and a leading provider of Windows integration software, has announced the availability of SCO VisionFS. SCO VisionFS, the newest member in the SCO Vision Family, provides file and print capabilities every PC user needs while accessing a Unix server.

This product allows a system administrator managing a group of PCs to provide file and print sharing capabilities from Unix servers to Windows PCs. Compared with conventional PC-based Network File System (NFS) products, VisionFS needs no client installation and is easy to administer, offering considerable time savings to the system administrator.

SCO VisionFS will support Common Internet File System (CIFS), Microsoft's remote file-sharing technology. Using standard components in the Windows operating system, people will be able to open and share remote files from their Windows PCs on a Unix server over the Internet, transparently.

The SCO Vision family gives the Windows PC user access to business-critical applications on the Unix server including-graphical X, SQL database, and character-based applications. SCO VisionFS is a Server Message Block (SMB) server for Unix systems that uses the existing networking components in Windows for Workgroups, Windows 95, and Window NT. It extends the file and print sharing capabilities of the Windows system to the Unix system environment. This is a more natural approach than imposing Unix NFS technology on a PC. Conventional PC-based NFS products must be installed on every PC, taking an average 20 minutes per PC to install, while SCO VisionFS is installed purely on the server in about 10 minutes. In a typical installation with 100 PCs and five servers, SCO VisionFS is installed in less than an hour, whereas a PC-based NFS product takes a full week. This saving is repeated every time the administrator updates the PCs.

The perception is that putting NFS on your PC is the only way you can provide file and print sharing between Windows and Unix. People are beginning to realize that there is a far more elegant solution that saves them time and money.

SCO VisionFS provi... same functionality as PC... NFS products and also ... extra features including ... cal administration with ... Editor, which makes ... editing of Unix files re... (PC-based NFS products ... the system administrator to ... edit system configuration ... total integration with the ... Manager, providing tran... access to printers on the ... network; and more effecti... trol over user access, ... compromising Unix syste... curity.

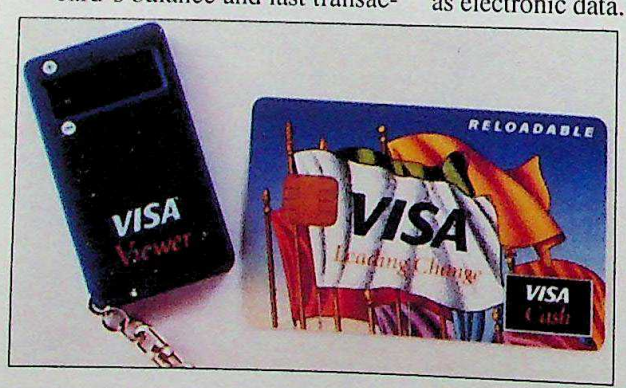
The Vision family pr... will go a long way in help... users access Unix servers.

SCO VisionFS. *SCO, ... Wing, Rashmi Avenue, T... Complex, Kandivli E... Bombay 400101. Tel: 887...*

STORED VALUE CARD

Visa Launches Visa Viewer, Visa Cash

Visa International has introduced a matchbox-sized personal electronic reader that quickly displays a stored value card's balance and last transaction. Named Visa Viewer, the stored value reader can be used by Visa Cash card-holders to access the information stored on the computer chip embedded in their card.



Visa Viewer made its debut at the Atlanta Olympic Summer Games, where over 1.5 million Visa Cash cards were issued to international visitors and residents. Later this year, Visa Viewer will be made available through participating financial institutions in Canada and Australia, where Visa Cash pilots are currently underway.

Visa Cash looks like a traditional bank card, but contains a computer chip that stores money as electronic data. Card-holders use Visa Cash to pay for low-value, everyday items and services. When the card is presented to a merchant, the amount of the purchase is automatically deducted from the monetary value stored on the card's chip. Visa Cash has been launched in Argentina, Australia, Canada, Columbia, New Zealand and Spain.

Visa is the world's largest payment system. In the year ended December 1995, Visa consumer card transactions (credit and debit) totalled more than US $ 802 billion.

Visa Viewer, VisaCash. *Visa International, 6th Floor, Raheja Towers, 26-27 M.G. Road, Bangalore 560001.*

INTRANET SOLUTION

Managing Documents Over the Web

US-based Information Dimensions, a leading document management solutions provider, has unveiled a solution to the problem of managing high volumes of business documents over the World Wide Web. The solution enables companies to integrate enterprise-wide document management applications with Web technology to develop industrial strength internal Web sites, or intranets, in days instead of months.

Called BASIS Intranet Solution, the software incorporates advanced security controls, and has a new rapid prototyping tool called the Corporate Information Center (CIC), which lets companies quickly build robust document management applications using customizable graphical Web-page interfaces and templates.

BASIS Intranet Solution integrates document management and retrieval technologies with a new version of the BASIS WebServer gateway, which is now fully integrated with the Netscape Enterprise server.

Combining these technologies with CIC eliminates time-consuming programming ... graphical Web interfaces ... allows fast intranet deploy... In short, BASIS Intranet S... tion delivers a ready-made ... ument management Web ... that can be easily tailored to ... cific business needs.

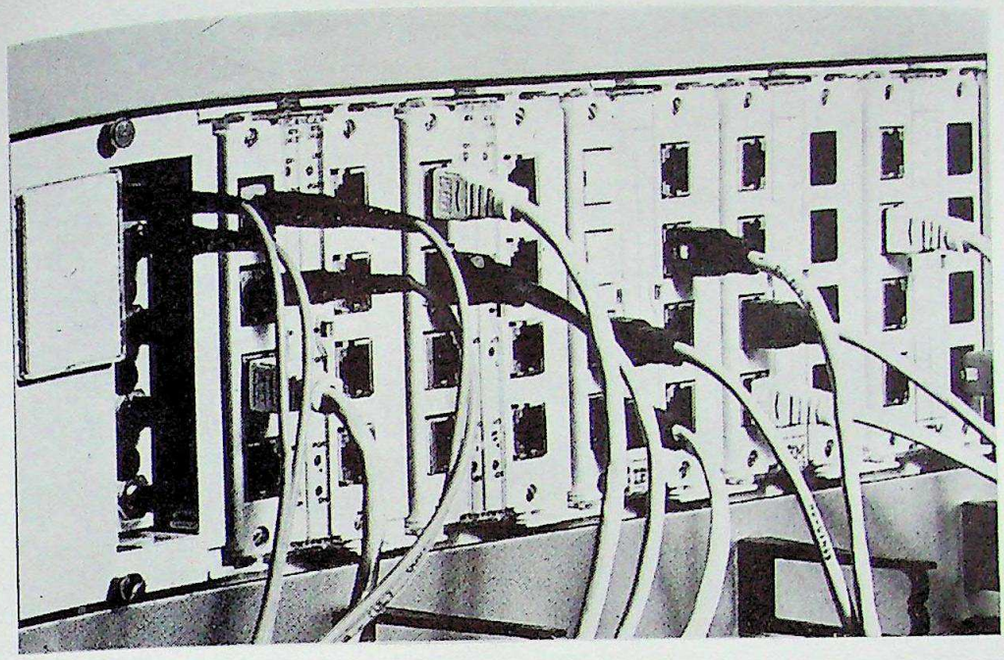
BASIS Intranet Solution ... fers sophisticated security ... trols like document views ... user authentication to pro... individuals with only the in... mation they are authorized ... access. In addition, the sys... provides document encryp... as well as integrity con... which help customers ... business-critical document... lections available at any g... moment without the fear of ... corruption.

BASIS products operate ... mainstream computing env... ments, and are compatible ... TCP/IP networks, Web ser... and client software, and SQ... based OBDC application de... opment tools.

BASIS Intranet Solution. *... Systems, 8/1 Pugh's Road, ... Annamalaipuram, Madr... 600028. Tel: 459207. Fa... 4348879.*

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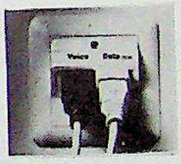


One system–One name IBM ACS

Generic Cabling System
IBM Advanced Connectivity System

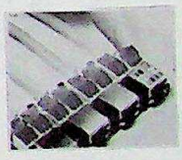
The following features mark out IBM-ACS as the complete system solution for generic cabling systems

- Full compliance with ISO/IEC 11801 & EMC requirements for all products
- Vendor Independent Generic Cabling System
- Product quality - German / Swiss manufacture
- 15 years warranty in India.
- Assured site certification in India. Each site is certified
- Full modularity for all medias voice, data, fiber and active network equipment



Safety for all network equipments the RJ45 Keying Systems "Data Safe Lock"

- Comprehensive range of optical fiber products with full compatibility.
- Unique Keying System for outlets : Data safe lock
- Completely shielded system available (FTP & SFTP, Optic Fiber & UTP)
- Advanced shield management
- Swivel mounted connection modules ease installation and maintenance
- Colour coded patch cords, outlets



Tool-free and time saving "Easy Lock" termination technique and advanced shield management

- Tool - free connection - quick and easy installation
- 45 degree angled wall-outlets for maximum long-term reliability
- PCB Mounted Connectors for maximum reliability
- Sophisticated labelling system for patch panels
- Test reports from independent test labs available.

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Advanced Connectivity System

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JOHN C. DVORAK

Living Under a Microscope

As I write this column, the largest known kiddie-porn ring in U.S. history has just been busted by Federal agents. News reports are depicting how the sting went down: Postal Service authorities raided the house of a suspected child pornographer and, after discovering a mailing list, set out to solicit buyers. Undercover postal inspectors, posing as letter carriers delivering the tapes, busted the guys who wanted this stuff. Everything was done through the mail. You could hear upstanding citizens applauding in the background. Bad guys in jail. End of story. Great bust, right?

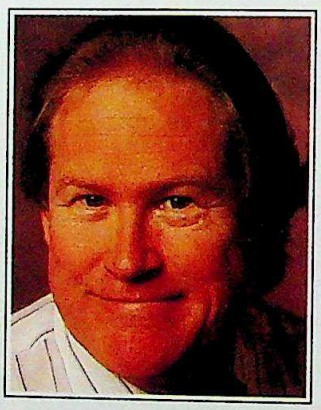
Curiously, after the arrests, nobody suggested the Postal Service should be abolished because pornographers use it to send indecent material. Think of the slogans: "If there were no Post Office, there would be no porn." Not once was the mechanism for delivery—the postal system—ever brought up in any critical way.

But just imagine the outcry if the Internet or a commercial service such as America Online or CompuServe had been involved. There would be a movement for legislation to prevent the use of technology for such activities. We'd see story after story about how out-of-control the Internet and online services have become. People would be calling for a ban on modems. Heck, just take look at the Telecommunications Bill and the Communications Decency Act rider, which impose much stricter regulations for online activities than for print media.

Fact is, the technological progress we make as a society is overscrutinized. Years ago, I was chatting with former *Nightline* correspondent Jed Duval about technology when he observed that the news media always overemphasizes any connection between new technology and any sort of negative outcome, oddity, or disaster. People are killed by the thousands slipping in their bathrooms, for example, but it's seldom reported. Meanwhile, some loner in Nebraska crashes his Cessna into a farmhouse and it's national news. Apparently, the loss of life isn't as important as the technology involved. And the newer the technology, the greater the scrutiny.

Lately, I've spent some time thinking about why that is. During the early days of the Industrial Revolution, steam boilers would blow up and make front-page news until licensing and inspection systems were in place to prevent such accidents. Now, you never hear about a boiler exploding. Odd as it sounds, the excessive scrutiny actually worked to make boiler systems safer.

Likewise, you've got to give the media credit for ranting about safety features like airbags until they became standard equipment in most cars. I have a friend whose life may have been saved by an airbag. Similarly, one guy in a Piper Cub crashing into a silo in Kansas should not be national news, but when it is overplayed, the likelihood of another wreck is lessened.



HUMAN ERROR

We can't trust technology. It can have all sorts of unknown flaws, especially in its infancy.

So it goes with more recent technology. Subconsciously, people worry about it. This seems silly to a technologist, but not to the general public. The fact is, we can't trust a product of technology. It's a piece of machinery, and it can have all sorts of unknown flaws—especially in its infancy. It could even blow up. After all, technology comes from the minds of humans and we simply can't expect to achieve perfection in our creations.

The personal computer, which has been a target of scrutiny since its inception in the 1970s, is under renewed attack with the rapid expansion of the Internet. The criticisms change over time. First, the PC was a homewrecker (circa 1978). The term "computer widow" was in vogue. Then it became some sort of hero and *Time* magazine proclaimed the device "Man of the Year" in the early 1980s. With the IBM PC revolution, a debate ensued over whether the computer actually increased productivity. Since nobody could prove that it did, the answer was a resounding (and wrongheaded) "No." Then along came business downsizing. People began mumbling about how PCs were actually displacing jobs, while making those who still had jobs much more productive. Now the computer is a connectivity tool that will change the world yet again. The Internet era has arrived, and with it, the scrutiny has intensified.

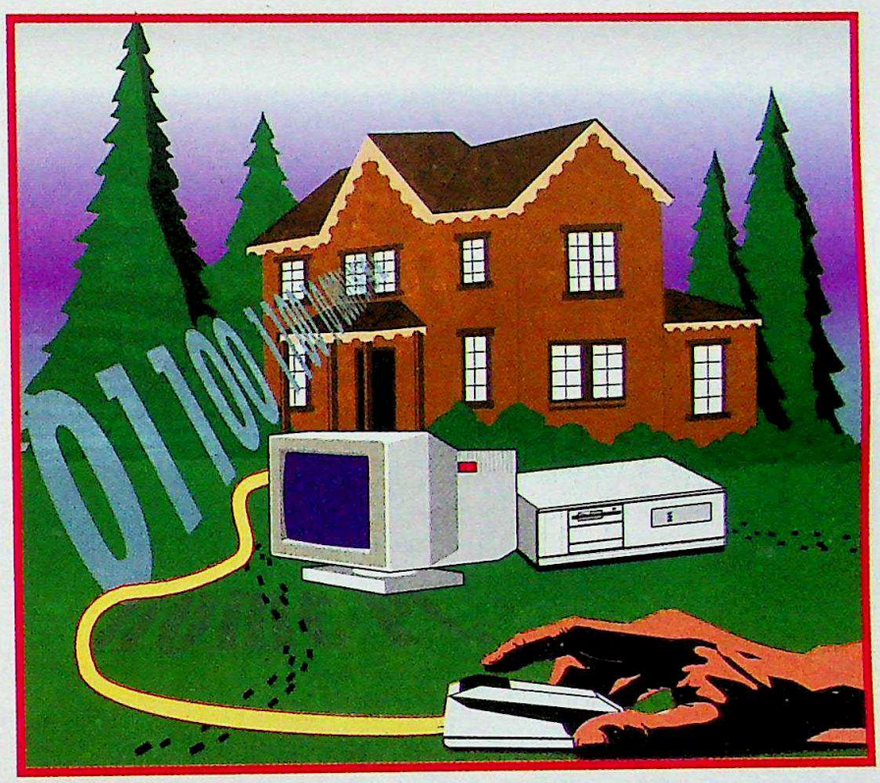
Sometimes, I think these shifts in public opinion are pretty ridiculous. But when I view them in an historical context, I realize how important scrutiny can be. There's nothing wrong with careful examination of change—after all, that's what technology is about: change. □

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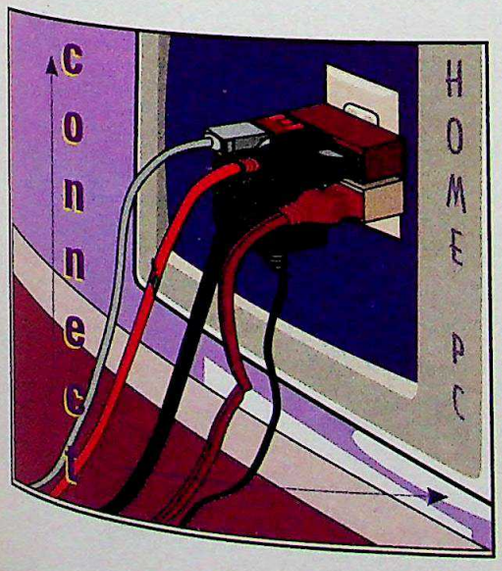
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Home PCs

Whether you're just starting out and need guidance, or know your way around computers, you'll find just what you need among this crop of 11 home PCs.



POWER HOUSE



By Bill Howard

What was unheard of three years ago is now commonplace: Free software bundles, color-coded cables, an easy OOBE (out-of-box experience), and multimedia configurations are all now standard issue for a home PC. So the odds are that any of today's home PCs will be fairly capable.

The current era in home PCs dates to mid-1993 and the introduction of Compaq's Presarios. They were the first exclusively home PCs from a major business-oriented vendor. Packard Bell also deserves credit for shaping this market and luring in vendors such as Compaq.

The home market has been growing substantially—20 to 30 percent in each year since 1991—but growth will be about half of that this year, according

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to market researcher CI/Info Corp. As a result, the number of high-profile vendors is shrinking. Digital Equipment Corp. jettisoned its home-oriented Starion line in January, and Dell deliberately makes its PCs unattractive to first-time buyers by not bundling lots of software titles or customized front ends and tutorials.

IN THIS REVIEW

Acer America Corp. 44	NEC Technologies Inc. 51
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REVIEW CRITERIA

For this review of home PCs, we sought the most prominent home PC vendors; this roundup of 11 machines was by invitation only. We sought home-oriented Pentium PCs with 1GB-plus hard disks, 16MB of RAM, quad-speed or better CD-ROM drives, multimedia sound, 15-inch or larger monitors, consumer-oriented setup features, Windows 95, and home software bundles. Processor speed was left up to the vendors.

The 11 vendors who participated were Acer America Corp., AST Computer, Compaq Computer Corp., Dell Computer Corp., Gateway 2000, Hewlett-Packard Co., IBM PC Co., Micron Electronics, NEC Technologies, Packard Bell Electronics, and USA Flex.

TWO CATEGORIES

We believe that there are two kinds of home PC buyers today, in addition to self-employed SOHO users working out of the house. First, there are the *traditional home PC buyers:* mom, pop, and the kids—playing games, studying, paying bills. They're first-time buyers or less technical repeat buyers who want EZ-setup PCs and lots of "free" software. We believe the market is starting to run out of rank-amateur, first-time buyers.

Second are the *power home users*—people who value performance and already have the software they want.

Of the 11 systems that we reviewed, units from Acer, Compaq, HP, and IBM are directed squarely at users in the first group. The units from AST and Packard Bell are in this category, too, although their features are less well-rounded. All were easy to set up and came with excellent software bundles, including Windows front ends; however, their test scores fell in the lower part of the range. NEC's entry lacks a customized front end but has many of the helpful touches that the others do.

Dell bundles only Microsoft Office and so belongs strictly in the second group. The Dell unit also lacks extensive setup help, but it is fast.

In between are systems from Gateway, Micron, and USA Flex. All have some combination of power, software, and easy setup, typically two out of three such features per vendor. Power users would be happy with any one of them; so might novice users. Gateway's P5-166, for instance, has great speed and the best software bundle of the bunch, but its OOBE rating is only average.

PERFECT HOME PC

You don't want your new PC to feel slow 18 months from now. So while the $1,499 price on stripped Pentium/75 systems are appealing, we believe the sweet spot of the market is one processor group down from the top. The top dog now are the Pentium/150 and Pentium/166 twins; their pricey CPUs currently sell for $428 and $632 per part, respectively, in 1,000-unit quantities.

One step below that is the Pentium/133 CPU, which sells for $321. Since Pentium/133 use a 66-MHz system bus, a well-tuned unit can surpass the performance of a Pentium/166 PC, which uses a 60-MHz bus. Minimalist Pentium/133 units can be had for $1,999; better-equipped systems run $2,500 to $3,500.

Our perfect home PC has 16MB—not 8MB—of RAM (more memory improves performance), a 256K secondary (L2) cache, a fast 1.2GB or larger hard disk, a 4X or faster CD-ROM drive, a 64-bit graphics accelerator, a 28.8-Kbps data/fax modem, and a 17-inch monitor so that you can operate comfortably at either 800-by-600 or 1,024-by-768 resolution. If you opt for 800-by-600, you should be fine with a 15-inch display—and you'll save $200.

PROBLEM AREAS

In testing, we found that our fastest PC (Gateway's P5-166) was nearly twice as fast as our slowest unit (Packard Bell's Designer Tower), as measured by our Winstone 96 rating of overall system performance.

There are four factors that

REPORT CARDS

Reading the Report Card

We graded each of the systems in six categories important to home users. The grades we used and their meanings are: A+, excellent; A, significantly above average; B, above average; C, average; D, below average; E, fail.

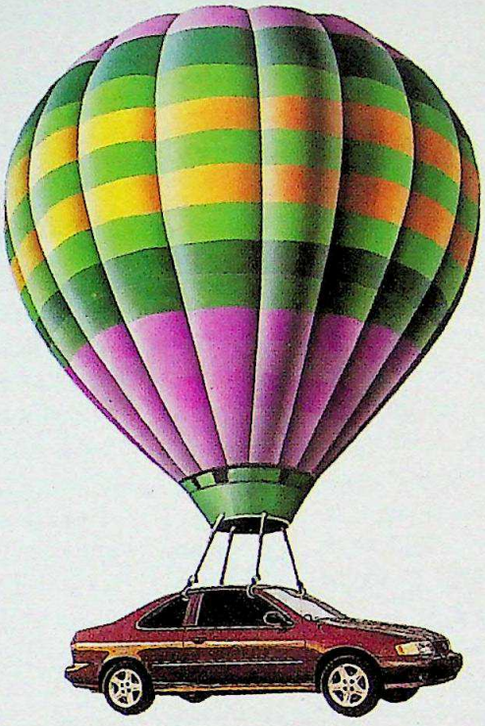
Setup focuses on how much setup assistance is provided for users. Setup posters, tutorials, color-coded cables, labeled ports, and a Windows front end all give extra points. **Performance** ratings represent overall system performance as measured by our ZD Winstone 96 and ZD CD-ROM WinMark 96 tests. A system's **sound** mark represents how well it fared on our subjective sound tests, in which we assess the quality of the sound card and included speakers when playing analog sound, .WAV files, and audio CDs. **Edutainment** indicates how well a unit suits educational and entertainment needs. We consider multimedia performance, software, and accessories. For the **productivity** category, we look at how well a system meets productivity needs. Key factors include bundled office suites, communications hardware and software, and performance.

REPORT CARD	
Product Name	
Setup	A+
Performance	A
Sound	B
Edutainment	C
Productivity	D

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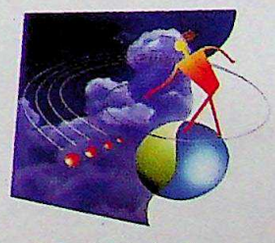
For starters, it provides you freedom from time and effort consuming CGI programming - once you couple it with the Oracle7 RDBMS. Making database integration extremely simple.

Then, Oracle WebServer also ensures the link is not broken immediately after a query is answered. This means, anyone visiting your site gets more information without having to establish links repeatedly. What makes this possible is a feature unique to Oracle WebServer - the Web Request Broker.

Besides these, Oracle WebServer is open and compliant with all Internet/Intranet standards - CGI, SSL, Java and C/C++. And is portable across all operating systems.

Now if you want to know more, contact us.

What's unfair about it?



Oracle WebServer

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Or visit us on the web at: http//:www.oracle.com/ **Regional Offices:** New Delhi Phone 6475286/87, Fax 6427653/6467923. Mumbai Phone 2832601/4151/1550, Fax 2853005. Calcutta Phone 2407450, Fax 2404114. Bangalore Phone 5593930, Fax 5593932. Madras Phone 8235271/72.

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account for the performance spread among the 11 PCs.

- *CPU speed.* CPUs ranged from 133 MHz to 166 MHz.
- *Detuned systems.* You can trade performance for stability. In home PCs, that's not a bad thing.
- *Lower-cost components.* AST, HP, and Packard Bell PCs came with slower 4,480-rpm hard disks; the others had 5,200- or 5,400-rpm drives. We estimate that this dropped overall system performance by more than 10 percent, or 5-plus points on the Winstone score. Packard Bell used a 32-bit graphics accelerator; the others had 64-bit adapters.
- *Cheaper cache.* Of the 11 systems, 6 used cheaper asynchronous L2 cache instead of faster pipelined-burst cache. Many home PCs don't have L2 cache at all; this can lower performance by 10 to 20 percent.

There was one performance ace in the bunch: Gateway's P5-166. One of our Editors' Choices in this roundup, it came with a Pentium/166 CPU, 512K of L2 pipelined-burst cache, and a high-end Matrox MGA Millennium graphics card.

Acer Aspire
Gateway P5-166

Home PCs, including the 11 we tested here, fall into two categories: PCs for first-time, nontechnical buyers and PCs for experienced users that focus on sheer performance. Our first Editors' Choice, the $3,098 Pentium/133-based Acer Aspire, offers the best array of features for novice users. With color-coded cables, a setup poster, and the Acer Computer Explorer (A.C.E.) Windows front end to guide you through Windows 95 and the other included software, Acer helps take the anxiety out of buying a new PC. The Aspire has a 17-inch monitor with integrated speakers, a 28.8/14.4-Kbps voice modem, a 6X CD-ROM drive, and a 2.1GB hard disk.

PC MAGAZINE EDITORS' CHOICE

Editors' Choice honors also go to the $3,837 Pentium/166-based Gateway P5-166: a no-holds-barred system that offers savvy power users not only class-leading performance but also top-notch sound featuring Altec Lansing ACS-400 speakers with a subwoofer. Performance was helped by the 512K of pipelined-burst L2 cache, 1.5GB hard disk, and Matrox MGA Millennium graphics card with 2MB of WRAM. The P5-166 also comes with a 28.8/14.4-Kbps data/fax modem, a 17-inch monitor, and useful productivity titles.

Honorable mention goes to the $2,895 USA Flex Multimedia Classic. The Pentium/133-based system boasts top-notch performance in its class, rivaling that of the tested Pentium/150 PCs, and many amenities for first-time buyers at a bargain-price. Its OOBE rating was not as high as others', however.

We also liked two other PCs. The Pentium/166-based Dell Dimension XPS P166 offers experienced users great performance and Microsoft Office for $2,999. Both types of users would be very happy with NEC's Pentium/150-based Ready 9552: It has good performance, easy setup, and a 28.8-Kbps DSVD modem plus an infrared transceiver.

SOFTWARE BUNDLES

Traditional home PC buyers are interested in both the quality and quantity of bundled software. Typically, you'll get an integrated package such as Microsoft Works (word processor, spreadsheet, database), a personal finance program, games, plus communications and a telephony package (answering machine, speakerphone).

BELLS AND WHISTLES

Some features of PCs are a matter of personal preference. For instance, the units from Acer and HP are beautifully sculpted, but that doesn't help their performance. Several vendors sell monitors with integrated speakers; you trade off some sound quality for convenience and fewer plugs and cables. Some also have 3-D sound that gives a bit more depth to the audio.

Certain accessories are also interesting: Compaq offers a Visioneer monochrome scanner integrated into the keyboard of some Presario models, HP will offer a color photo scanner (snapshot-size) standard in Pavilion 7130P models, and Compaq also offers the Panasonic PD/CD drive with some PCs. This drive acts as a normal 4X CD-ROM drive but is also capable of reading and writing to proprietary, rewritable 650MB phase-change cartridges.

All of the machines we tested came with modems. AST, IBM, and NEC have DSVD shared voice and data modems.

WHAT'S AHEAD

As the year progresses, look for vendors to offer more specialty systems. NEC earlier this year sold 5,000 game-oriented PCs, the Ready PowerPlayer LE series. Gateway recently announced Destination, a PC with a wireless keyboard and a 31-inch monitor that doubles as a TV set. A Pentium/120 Destination with 16MB of RAM, 1.2GB hard disk, multimedia titles, and a 6X CD-ROM drive will cost about $4,000. Several vendors are also talking about offering Internet PCs with ISDN adapters.

By the time of the fall fresh of PCs, you'll see MHz Pentium CPUs available. At that point, the best sweet spot will be systems with 166-MHz CPUs. And at the end you may see the P55C high-speed Pentium optimized for multimedia applications. Also look for EIDE hard disks available in 2.5GB capacities, 3-D rendering to give animation and games a more lifelike feel; and machines equipped

Our Contributors: BILL HOWARD is an executive editor of *PC Magazine*. ROBERT S. ANTHONY is a senior writer at *PC Magazine*. MARY E. BEHR and DAVID LIDSKY are staff editors of *PC Magazine*. ANUSH YEGYAZARIAN, a staff editor of *PC Magazine*, was the editor in charge of this story, and RICHARD FISCO was the project leader.

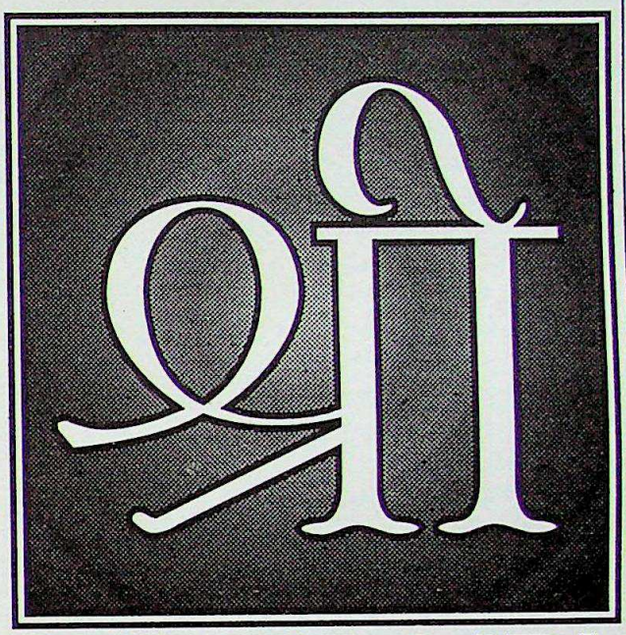
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Digitized by Arya Samaj Foundation Chennai and eGangotri

Indian language fonts and script processor working under Windows 3.1, Windows-95, Macintosh.

New attractive options

- Over 12000 satisfied users in over 80 cities.
- Library of 1300 fonts.
- Fixed fonts as well as choice fonts packages available.
- Shree-Lipi supports Devnagari, Gujarati, Tamil, Kannada, Telugu, Punjabi, Malayalam, Bengali, Oriya, Assamese, Vedic Sanskrit. Even Sindhi and Arabic are supported under PageMaker 5.0.
- A variety of keyboard layouts supported.
- Shree-Styler : A font styler which can produce expanded, condensed, slanted, outlined, fat, thin fonts given free with Shree-Lipi package.
- Import utilities : Text created in a number of other Indian language packages can be converted to Shree-Lipi format.
- Shree-Lipi packages range from economical to deluxe, available to suit your budget.



SHREE-LIPI

New attractive options which you can get* with Shree-Lipi

❖ Spell-Checker ❖



Spell checker for Hindi or Marathi which works along with PageMaker, MS-Word etc. Spell Checker comes with a rich dictionary of words backed up by program checking with elaborate language rules. Spell checker for other languages is under development.

❖ Avishkar ❖



A special font styler with 20 free fonts. Along with various degrees of condensation, expansion, forward slant, reverse slant, fattening, thinning, outlining, graded outlining, you can attach more than 180 aesthetically designed serifs to the characters. Envelope transformations are also possible on each character. The style chosen can be previewed on the screen. Currently available for Devnagri and Gujarati.

❖ Suchika ❖



A number of utilities to handle Indian language data bases. The utilities include sorting of data bases on Indian language fields, conversion of ISCII data bases to Shree-Lipi format, transliteration of selected fields etc.

❖ Roopa ❖



Roopa is a 'Text Styling' package which allows you to give different 'effects' and 'styles' to a text string entered. Various envelope effects, multiple shadows, extrusions, shaded outlines, color shading etc. are provided. Roopa gives you readymade styles at a click of mouse which you can get from a more expensive package after a lot of effort. You can copy the output on Clipboard or store it as a Metafile.

* at additional Licence fee

For more details Contact

Modular Systems

26, Electronic Co-op. Estate, Pune Satara Road, Pune - 411 009 INDIA.
Tel. : 0212-437994/423510. Fax : 0212-425896/452323. E-MAIL:MODULAR.PUNE@SM08.SPRINTRPG.SPRINT.COM

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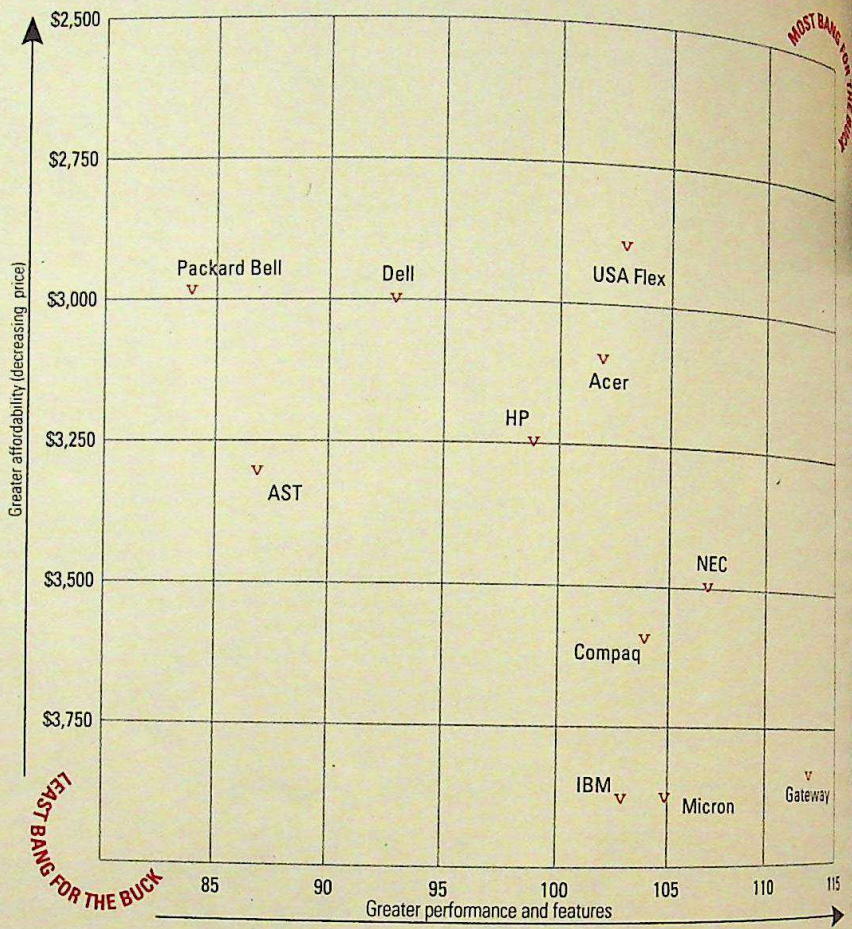
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Price/Performance Index: Home PCs

Our Editors' Choice in the power-home-user category, the $3,837 Gateway P5-166, earned the best performance/features ratio in this roundup. This PC, a top performer, garnered the highest Winstone 96 score in this roundup. It also features an extensive software bundle and an exceptional sound system.

The $3,098 Acer Aspire, our Editors' Choice recipient in the novice-user category, also placed well on our chart. This machine received a grade of A+ for setup, a score matched by no other PC in this roundup.

The USA Flex Multimedia Classic, which received an honorable mention in this roundup, distinguished itself thanks to its top-notch components, leading performance within its CPU group, and excellent software bundle—all for $2,895.



THE DATA POINTS

Because this is a home-oriented roundup, we've reapportioned the performance/features weights. Benchmark test results account for 18 percent of the score; previously, they had accounted for 45 percent. Warranty information, service and reliability ratings, and OOBE features account for 29 percent. Software compatibility ratings and sound ratings account for 13 percent. Various hardware features account for the rest of the score.

You can find price/performance index data in the Hardware Library of the Editorial Forum on PC MagNet under 08BANG.txt and on the World Wide Web at *http://www.pcmag.com*.

with a Universal Serial Bus (USB) to give you the ability to connect multiple devices without running out of connectors or interrupts.

Acer America Corp.

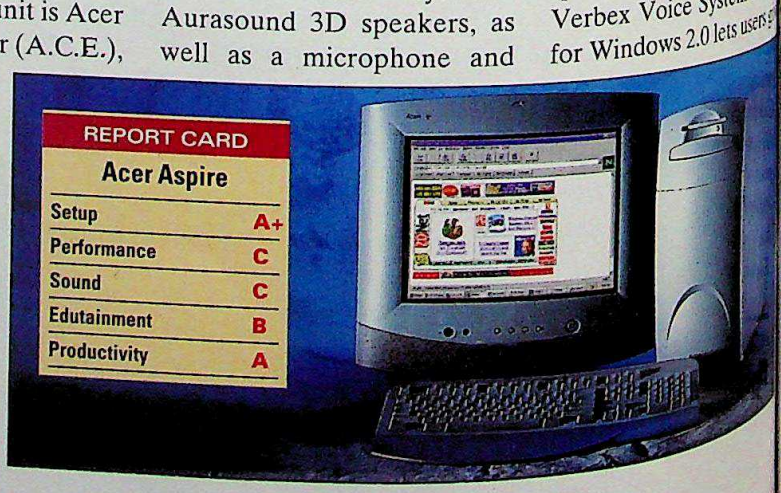
Acer Aspire

Acer America's $3,098 Aspire, our Editors' Choice for first-time buyers, is leading a home PC revolution. From its curvy, nonconformist design to its competitive performance and effortless setup, the 133-MHz Pentium-based minitower is a standout in a world of beige boxes. Acer also offers the AcerPower line of corporate PCs.

Color-coded cables and a setup guide make setup easy. Bundled with the unit is Acer Computer Explorer (A.C.E.), an engaging Windows 95 front end that gives users quick access to online help.

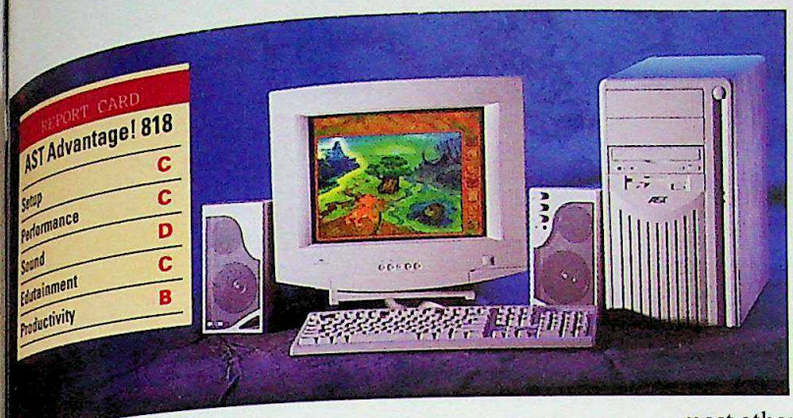
The Aspire's emerald green case design (also available in charcoal) is anything but typical: Even the monitor's ventilation holes are stylish. The sculpted keyboard has a removable purple wrist rest; the 17-inch monitor has front-mounted Aura Systems' Aurasound 3D speakers, as well as a microphone and headphone jacks.

The monitor speakers [illegible] 28.8/14.4-Kbps voice mod[illegible] combine to create a full-[illegible] speakerphone with voice [illegible] Verbex Voice System's Li[illegible] for Windows 2.0 lets users [illegible]



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ple verbal commands to the ture (such as Open or Close e).

The rest of the software bun- e was adequate. Notable titles clude Intuit's Quicken SE D-ROM, Microsoft Works, Creative Multimedia's mily Doctor. The unit en- untered no problems on our ftware compatibility tests.

The Aspire came with a GB hard disk, a 6X CD- OM drive, and a graphics sub- stem based on an ATI ach64 chip set with 2MB of RAM.

On our benchmark tests, the spire posted an above-average isk WinMark 96 score com- ared with those of the other entium/133 PCs; its Winstone , CD-ROM, and Graphics inMark 96 scores were aver- ge. Its CPUmark scores were w, however, because the ma- hine used the slower, asynchro- ous cache instead of the faster, pelined burst cache.

The warranty covers three ars on parts and labor and in- ludes a year of on-site ser- ice.—*Robert S. Anthony*

cer Aspire. Estimated street rice: $3,098. Acer America Corp., San Jose, CA.

ndian subsidiary AST Com- puter, Bangalore; partners ADML, Bangalore; CMS, Bom- ay; PCS-DG, New Delhi; TUL, Tangerine, Bombay.)

AST Computer

Advantage! 818

A well-rounded software bundle and remote diagnostic features make AST Computer's $3,305 Advantage! 818 a user-friendly home system. AST aims the unit at more experienced multimedia home users, but some of these buyers may be disappointed by the unit's below-average performance. AST also makes the Premmia line of high-end corporate and CAD workstations and Bravo line of business PCs.

The 818's setup was fairly simple. And once the PC is on, you can access online help through the AST Spot, a blue dot that sits innocuously on the Windows 95 desktop.

The unit's 15-inch monitor had a microphone and two speakers built into the case, but a set of powered speakers was also sent; these were tested with the unit and are included in the quoted price. The powered speakers sounded better than the integrated ones but still had an audible hiss.

Syncro Multimedia Connect software and the 28.8/14.4-Kbps DSVD voice modem allow fax, multiple voice-mail boxes, and a full-duplex speakerphone. Other bundled software includes Quicken SE and Grolier's Multimedia Encyclopedia. The unit did well on our software compatibility tests.

The 818's test scores came in at below average for its group across all our tests. Its 1.6GB Maxtor hard disk had a slower rotational speed than most others in this roundup, and its use of asynchronous cache lowered its CPU scores and affected all other subsystems.

The unit comes with AST LifeLine remote diagnostic software. AST also provides 30 days of free technical support for third-party software and a one-year warranty with on-site service.—*RSA*

Advantage! 818. Street price: $3,305. AST Computer, Irvine, CA. *(Indian subsidiary AST Computer, Bangalore; partners ADML, Bangalore; CMS, Bombay; PCS-DG, New Delhi; TUL, Tangerine, Bombay. Price : Rs 61,000 with 8 MB hard disk.)*

Compaq Computer Corp.

Presario 9660

Compaq Computer Corp.'s $3,593 Presario 9660 has enough features to keep any home PC user satisfied. Compaq also boasts top-notch service and reliability ratings. But it lacked performance for its class: The other reviewed Pentium/166 PCs performed significantly better on our tests.

The Presario 9660 is the flagship in Compaq's Presario line of multimedia home PCs, which includes the value-oriented 7200 series and the midrange 9200 line. Compaq also markets business systems: The ProLinea value line, the DeskPro network line, and the high-end DeskPro XL series.

Setting up the 9660 is a snap with the help of a poster guide and a set of quick-reference booklets. The unit includes the easy-to-use Presario Gallery as a front-end shell and offers extensive online help. Software includes Compton's Interactive Encyclopedia 96, PerfectWorks 2.1, Quicken for Windows 4.0, and Interplay's Descent.

The Presario's main board is rich in integrated features such as S3's Trio 64V+ graphics chip set with 2MB of EDO DRAM, Compaq's 16-bit wavetable audio chip, and an MPEG decoder chip. Other features include a 28.8/14.4-Kbps voice modem and a 2.1GB hard disk.

The unit's 15-inch monitor has two speaker "ears" and a front-panel volume control; its keyboard has the two special Windows 95 keys used in Microsoft keyboards.

Because it used asynchronous cache, the Presario's test scores couldn't match those of the other tested Pentium/166 PCs. However, its scores were mostly average for all the reviewed PCs. Its CD-ROM WinMark 96 score was above average because of its fast 6X



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Benchmark Tests: Home PCs

What the Numbers Mean

ZD WINSTONE 96

With an impressive array of top-performing components, the Editors' Choice Gateway P5-166 earned the highest Winstone 96 score ever recorded in a comparative review: 77. A Pentium/166 CPU, 512K of pipelined-burst L2 cache, EDO DRAM, a 5,200-rpm Enhanced IDE (EIDE) hard disk, and a Matrox MGA Millennium graphics card contributed to this PC's great performance. The top-performing Pentium/133 system, the USA Flex Multimedia Classic, earned a respectable score of 63. With 256K of pipelined-burst L2 cache, the same hard disk as Gateway's entry, and a Hercules Graphics Terminator Pro PCI 2M graphics card, the USA Flex Multimedia Classic even outperformed tested Pentium/150 PCs.

ZD GRAPHICS WINMARK 96

The Gateway P5-166's Matrox graphics accelerator card helped it garner a score of 30.3 on our Graphics WinMark tests. The Millennium uses Window RAM, which has a dual-ported design that enables it to transmit graphics-drawing-data input and screen-refresh output simultaneously.

The Packard Bell Designer Tower's graphics subsystem, based on an integrated 32-bit Cirrus Logic CLGD 5440 chip set (all other systems in this roundup used 64-bit chip sets), produced this roundup's lowest Graphics WinMark score.

ZD DISK WINMARK 96

Units with Quantum Fireball Fast ATA-2 hard disks showed the best disk performance. Thanks to the disk's 5,400-rpm rotational speed and high transfer rate, these systems edged out units using Western Digital Caviar AC31600 disks, except in one case. The NEC Ready 9552, with a Pentium/150 and a Caviar AC31600, beat out the IBM Aptiva A50, with a Pentium/150 and a Fireball 1080A disk. It was the Aptiva A50's slower CPU/memory subsystem that made the difference, negatively affecting its performance on our other tests.

ZD CPUMARK$_{16}$ AND ZD CPUMARK$_{32}$

Just over half the systems in this roundup used asynchronous L2 cache, which cannot handle the faster burst timings that synchronous cache can. Systems using pipelined-burst synchronous cache were able to outperform those with asynchronous cache by a significant margin on our CPUMark$_{16}$ tests.

The Gateway P5-166's use of 512K of pipelined-burst cache, twice what is usually found in mainstream or home PCs, gave this unit the top CPUmark$_{16}$ score. Three systems—Acer's, Compaq's, and IBM's—used non-Intel sets. Although it may look as if these chip sets performed poorly, again, it was the type of cache that counted most. All three PCs came with asynchronous cache.

CD-ROM AND MULTIMEDIA TESTS

The AST Advantage! 818 was the only PC to drop a significant number of frames when we tested high-quality video playback. It had an ATI Mach64 graphics chip set with an older version of the graphics driver than the one in the Acer, which had the same graphics chip set but dropped no frames.

To stress the video subsystems, we also ran a clip at 300 KBps that we expanded to full screen. Color-space conversion and *x* and *y* interpolation built into the graphics chip set are keys to good performance on the full-screen tests. Chip sets such as the S3 Trio 64V+, used in Compaq's unit, and the Trident 9680XGi, used in IBM's PC, have the features necessary but the Compaq PC used an older driver, and we suspect the IBM PC's driver was less optimized. Both, therefore, dropped frames. Units using chip sets without *x* and *y* interpolation, such as the ATI Mach64 and the Cirrus Logic CLGD 5440, dropped the most frames.

The CD-ROM drives all performed as expected except the Wearnes CDD-620 in the Gateway P5-166. It is a 6X drive, but its showing on our Sequential 16K Read test reminded us of 4X drive performance. The drives's average access time of 240 ms is extremely slow for a 6X drive and resulted in the system's poor CD-ROM WinMark score.

—Analysis written by Richard Fisco

▲ Higher scores represent better performance. ▼ Lower scores represent better performance. Red type denotes first place.	ZD CPUMark$_{32}$ ▲	ZD CD-ROM WinMark 96 ▲	CD-ROM			HIGH-QUALITY ACTION INDEO[1]		FULL-SCREEN SCALING[2]		MEDIUM-QUALITY ACTION CINEPAK[3]	
			Sequential 16K Read (KBps) ▲	Access Time (ms) ▼	CPU Utilization ▼	Frames Dropped ▼	CPU Utilization ▼	Frames Dropped ▼	CPU Utilization ▼	Frames Dropped ▼	CPU Utilization ▼
Acer Aspire (P/133)	179	436	916	248	37%	0	75%	448	97%	0	50%
AST Advantage! 818 (P/133)	204	368	610	313	55%	32	96%	355	99%	0	77%
Compaq Presario 9660 (P/166)	226	548	919	169	48%	0	90%	346	100%	0	66%
Dell Dimension XPS P166c (P/166)	301	605	919	168	30%	0	53%	0	64%	0	40%
Gateway P5-166 (P/166)	326	480	609	238	38%	0	72%	0	75%	0	57%
HP Pavilion 7090 (P/133)	212	376	613	248	30%	1	74%	0	73%	0	52%
IBM Aptiva A50 (P/150)	216	581	919	169	40%	0	71%	158	100%	0	54%
Micron P166 Home Pro MPC (P/166)	309	577	920	160	52%	0	62%	0	68%	0	40%
NEC Ready 9552 (P/150)	257	417	613	230	46%	0	86%	0	97%	0	66%
Packard Bell Designer Tower (P/133)	202	447	615	221	25%	0	91%	440	98%	0	64%
USA Flex Multimedia Classic (P/133)	270	507	901	203	60%	0	66%	0	71%	0	49%

1 With an Action, Indeo, 320 x 240, 30-fps, 600-KBps clip.
2 With an Action, Indeo, 160 x 120, 30-fps, 300-KBps clip scaled to full screen (1,024 x 768).
3 With an Action, Cinepak, 320 x 240, 30-fps, 300-KBps clip.

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How We Tested

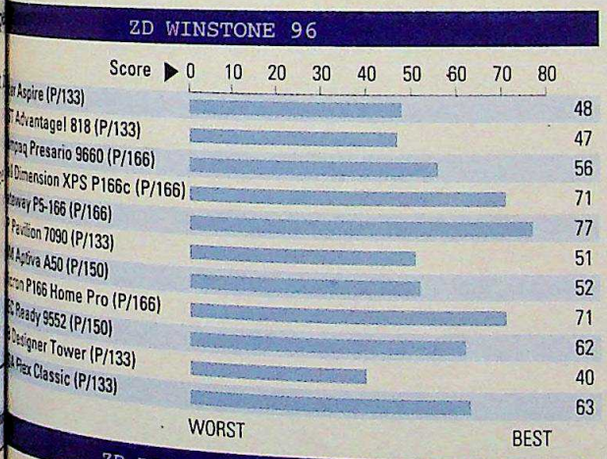
We tested all PCs with 1GB hard disks or larger, 4X CD-ROM drives or faster, 16-bit sound boards, and 16MB of RAM. We used each vendor's preinstalled video drivers for 1,024-by-768 resolution with 256 colors, small fonts, and a screen refresh rate of 75 Hz (or as close as possible). We also disabled power-management features and let Windows 95 manage virtual memory settings.

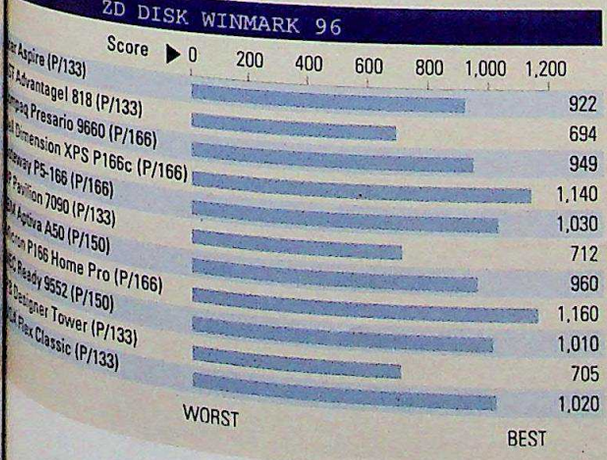
We use our benchmark test suite **ZD Winstone 96, Version 1.0,** to measure performance when running Windows applications. Winstone 96 measures how long a PC takes to execute a set of scripts that exercise 13 best-selling Windows applications. Winstone weights a given PC's test timings based on the applications' unit market shares; it derives a composite number and converts it to a relative score. (The score is relative to the performance of a 486DX/25 Dell 425s/P with 8MB of RAM, whose score is defined as 10.)

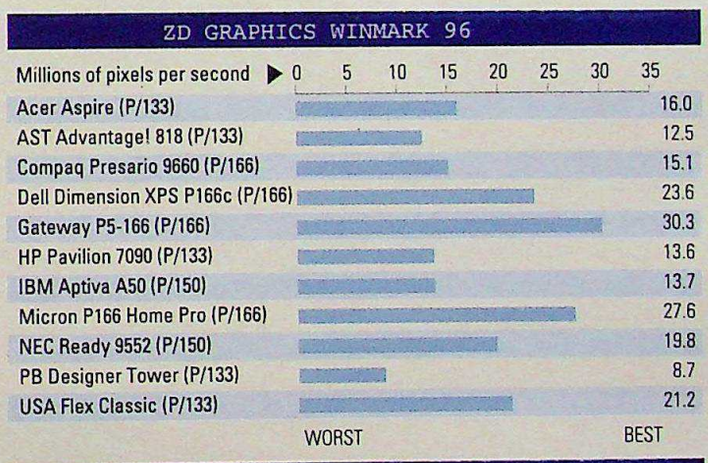
We use our benchmark test suite **ZD WinBench 96, Version 1.0,** as a measure of graphics, disk, processor, CD-ROM, and motion-video performance under Windows. The **ZD Graphics WinMark 96** score, a number based on 115 calls of Windows GDI functions, represents the performance of each machine's graphics subsystem under Windows. The **ZD Disk WinMark 96** score, a harmonic mean based on application profiling, represents the disk subsystem's performance under Windows. The **ZD CPUmark$_{16}$** and **ZD CPUmark$_{32}$** scores indicate the speed of a PC's processor subsystem under 16-bit and 32-bit Windows operating systems, respectively. WinBench 96 bases these scores on large instruction mixes that emulate the processor activity of real-world applications. The **ZD CD-ROM WinMark 96** score gauges the performance of each PC's CD-ROM subsystem, which includes the CD-ROM drive, its adapter, and the software drivers it requires to operate. This test is based on a profile of six of today's most popular Windows CD-ROM applications.

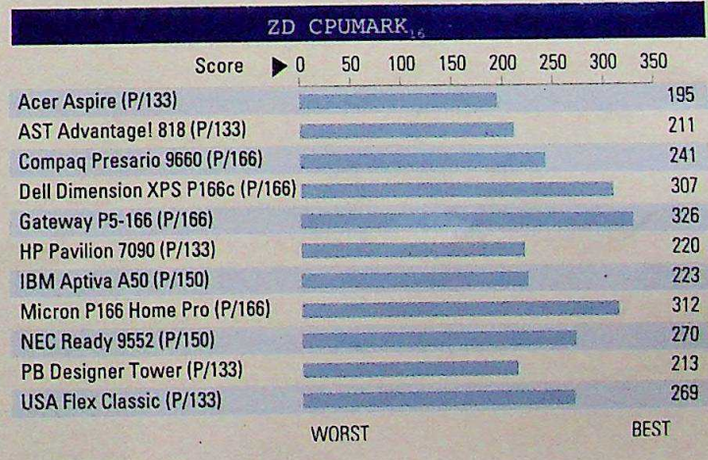
We report the results of the CD-ROM **Sequential 16K Read** test, which measures the throughput of the CD-ROM subsystem when reading 16K blocks of data on a CD-ROM. The CD-ROM **Access Time** test measures the CD-ROM drive's performance while randomly accessing 2K files from the CD-ROM. We also use the CD-ROM **CPU Utilization** test to report the percentage of the processor's bandwidth occupied by servicing the CD-ROM subsystem while retrieving data. To determine utilization, WinBench 96 uses a default block size of 16K. The transfer rate defaults to the maximum transfer rate of the CD-ROM subsystem. WinBench 96 calculates the transfer rate before it runs the test. WinBench 96 also includes Video Test, a test suite comprising 33 video clips, to measure a PC's ability to play full-motion .AVI video files. The Video Test measures a system's video-playback performance using either the Indeo or the Cinepak codec. We report results from the **High-Quality Action Indeo** tests, which use the Action, Indeo, 320-by-240, 30 frame-per-second, 600-KBps video clip; the **Full-Screen Scaling** tests, which use the Action, Indeo, 160-by-120, 30-fps, 300-KBps video clip; and the **Medium-Quality Action Cinepak** tests, which use the Action, Cinepak 320-by-240, 30-fps, 300-KBps video clip. We report both the number of **Frames Dropped** while playing each clip and the **CPU Utilization,** which is the percentage of processor resources used to run each clip.

Our software compatibility tests called for a unit to be able to load and run the following applications successfully: Compton's Interactive Encyclopedia 1996, LucasArts' Dark Forces, Disney's The Lion King Activity Center, Microsoft 3D Movie Maker, and Origin's Wing Commander III: Heart of the Tiger. Go to *http://www.pcmag.com* for a chart of results and more analysis.









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CD-ROM drive.

Compaq provides a three-year parts, one-year labor warranty with 90 days of free on-site service.—*RSA*

Presario 9660. Estimated street price: $3,593. Compaq Computer Corp., Houston, TX.

(Indian subsidiary Compaq Computer Asia, Bangalore; partners BPL, Bombay; CMC, New Delhi; Fujistsu-ICIM, Bombay; Microland, Bangalore; Tangerine, Bombay; Unicorp, New Delhi.)

Dell Computer Corp.

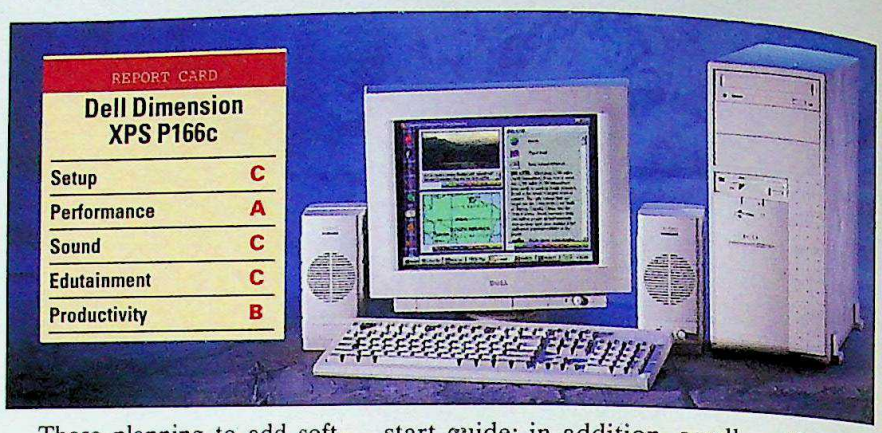
Dell Dimension XPS P166c

The $2,999 Dell Dimension XPS P166c's combination of lowest price for tested Pentium/166 PCs and above-average performance makes it very attractive to experienced home users. The included Microsoft Office 95 package should satisfy the unit's target audience of SOHO buyers, but no other application software is included. Dell offers the Dimension line for small- to medium-sized businesses and targets the OptiPlex line for corporations.

Dell makes it clear that the Dimension XPS is not for PC novices. The unit comes with a setup guide and information about the company's support offerings, but few other amenities for beginners are offered.

The Dimension is powered by 256K of pipelined-burst L2 cache, a 1GB Quantum Fireball hard disk, and a Number Nine 9FX Motion 771 graphics card. These high-end elements showed their worth on our tests, with all scores above average for the tested group.

Sound is handled by a 16-bit sound card and Altec Lansing ACS5 speakers. A 15-inch monitor, 6X TEAC CD-ROM drive, and 28.8/14.4-Kbps fax modem came with the unit.



Those planning to add software can rest assured: The unit had no problems on our software compatibility tests. Its great hardware makes it a capable blank canvas for edutainment functions despite its lack of software. The Dimension has a three-year parts, one-year labor and on-site service warranty.—*Mary E. Behr*

Dell Dimension XPS P166c. Direct price: $2,999. Dell Computer Corp., Austin, TX.

(Indian partners ESPL, Chandigarh, PCL, New Delhi; Rolta India, Bombay.)

Gateway 2000 Inc.

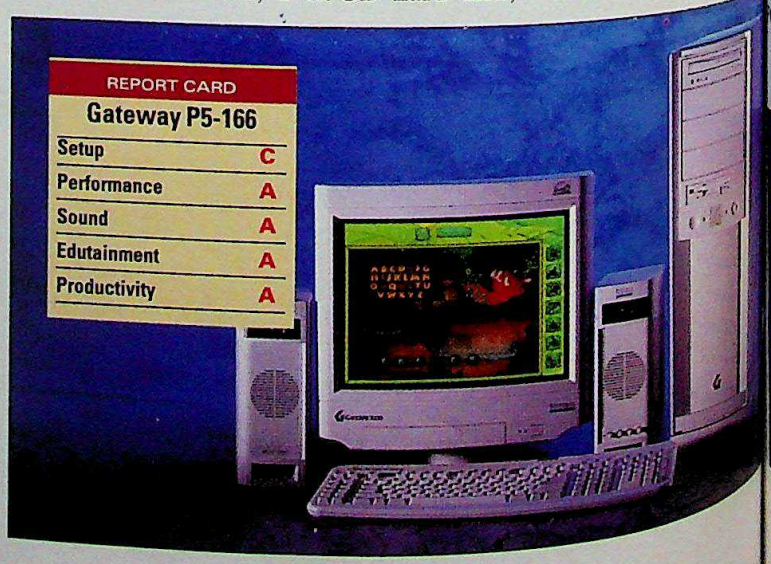
Gateway P5-166

Whether you're a games aficionado or a home-office worker, you won't be disappointed with the $3,837 Gateway P5-166, our Editors' Choice for experienced users. The Pentium/166 tower unit is aimed at power home users and features top performance, great software (including Microsoft Office Professional 95), a 17-inch monitor, and a top-shelf audio system. Gateway markets its Family Line of home PCs to cost-conscious first-time buyers.

Gateway supplies documentation and a quick-start guide; in addition, small icons mark each rear port.

Gateway offers its Pentium PCs with a variety of software bundles. The tested unit came with the vendor's Generations II Software Collection (family and home-oriented); Finance Software Pack, and Kid's Backpack II, which even includes a cow-spotted vinyl backpack. (These latter bundles are options, priced at $79 and $59 respectively, and are included in the price above.) The unit encountered no problems on our software compatibility tests.

"Awesome" sums up our opinion of the unit's Altec Lansing ACS400 speakers, ACS250 subwoofer, and 16-bit Ensoniq wavetable sound card. The combination received the highest mark of any system reviewed on our subjective sound tests. A Matrox MGA Millennium graphics card with 2MB of WRAM, a 1.5GB hard disk,



and a 6X ... ROM drive ... out the unit's ... ware.

The ... earned the ... Winstone ... Graphics ... Mark 96 ... this round ... achieved ... results on ... other tests.—*RSA*

Gateway P5-166. Direct ... $3,837. Gateway 2000, N. ... City, SD.

(Indian partner DCM ... Vikram Tower, 4 Rajendra ... New Delhi. Price : Rs 19...

Hewlett-Packard Co.

HP Pavilion 7090

Hewlett-Packard has ... signed the Pentium ... based Pavilion 70... be a PC for the entire f... Its mix of an easy setup, ... ful custom front end, and ... good software—all at ... fordable $3,248 street ... make it appealing. The ... performance was compet... for its class. HP also ma... the Vectra lines of bus... PCs: the entry-level VE ... the value-oriented VE ... network-ready XMs, and ... high-end XU line.

HP includes color-co... cables and a poster to fac...

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Service and Reliability

Service and Reliability ratings are derived from *PC Magazine*'s 1995 reader survey on vendor service and reliability for PCs in use over the past two years.

The *reliability* rating is a measure of respondents' satisfaction with the reliability of a vendor's machines. The *repair* and *tech support* ratings are measures of respondents' satisfaction with the vendor's repair service and technical support, respectively. The *percent needing repair* rating is a measure of the percentage of computers that respondents indicated needed repair during the first year of use.

Better than average = ▲ Average = ● Worse than average = ▼

Vendor	Reliability	Repair	Tech support	% needing repair
Acer	●	●	●	●
AST	▲	▲	●	▲
Compaq	▲	▲	▲	▲
Dell	▲	▲	▲	●
Gateway	▲	▲	▲	●
Hewlett-Packard	▲	▲	▲	▲
IBM	▲	▲	▲	▲
Micron	▲	▲	▲	●
NEC	●	●	●	▲
Packard Bell	●	▼	▼	▲
USA Flex	●	●	●	▼

IBM PC Co.

IBM Aptiva A50



The $3,878 Pentium/ 150-based IBM Aptiva A50 has a lot to make it attractive to first-time home PC buyers, such as easy setup, a helpful customized front end, good productivity software, games, and top-notch service and reliability ratings. However, some may be disappointed by the unit's lackluster performance. IBM also offers the mid-range PC 300 and high-end PC 700 lines of business PCs.

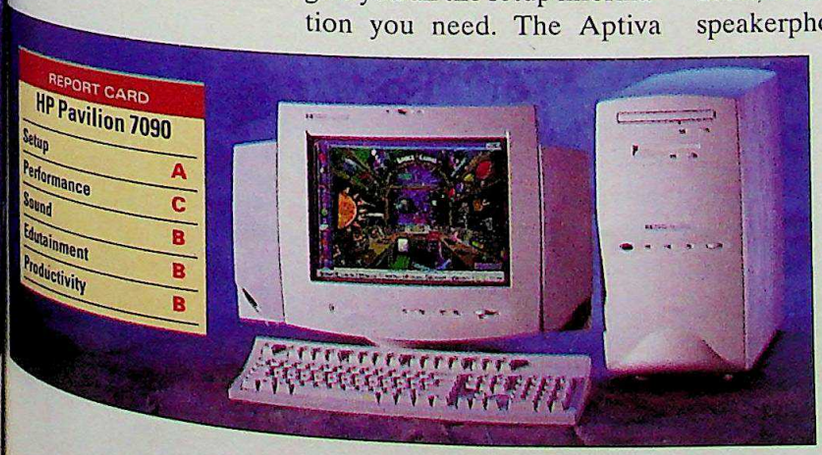
IBM provides a detailed setup poster and booklets that give you all the setup information you need. The Aptiva Guide, a custom front end, offers a multimedia tour of your PC and provides tutorials.

The unit comes with a 17-inch monitor and an IBM MWave combination 16-bit sound card and 28.8/14.4-Kbps DSVD modem. With IBM Operator, the PC acts as a fax and answering machine for multiple users; it also has a full-duplex speakerphone. Voice Type Control lets you navigate Windows using basic voice commands; Rapid Resume puts your PC in suspend mode and wakes it up to receive messages and faxes.

The integrated Trident 9680 XGi graphics chip set is optimized for MPEG functions (IBM offers a combination software and hardware MPEG solution). The unit performed well on most video tests.

Because the unit had 256K of asynchronous L2 cache, its scores on our CPUmark tests were low. The Aptiva's slow CPU/memory subsystem affected its other test scores: Most were below average for the tested group, though its 1GB Quantum Fireball hard disk and fast TEAC 6X CD-ROM drive helped it achieve good Disk WinMark 96 and CD-ROM WinMark 96 scores. The unit now comes with a 1.6GB hard disk.

Software includes an IBM Internet browser, Compton's Interactive Encyclopedia 96, Lotus SmartSuite, Descent,



setup and navigation
Personal Page, its front
Personal Page gives you
animated tour of your PC's
ware and offers tutorials.
This minitower also has a
GB hard disk, 256K of asyn-
onous L2 cache, a 4X CD-
OM drive, 16-bit sound card
h FM and wavetable synthe-
and a 28.8/14.4-Kbps
ax/fax modem. The 15-inch
monitor boasts detachable
ec Lansing speakers, a mi-
phone, headphone jack, vol-
e control, and a mute button.
Graphics performance,
wered by an S3 Trio 64V+
ip set with MPEG playback
abilities and 1MB of
RAM, was below average
r the tested group. Winstone
and Disk Winmark 96
ores were also below aver-
; the rotational speed of the
it's Maxtor hard disk—
wer than that of most oth-
s in this roundup—no doubt
ected its performance.
Bundled software includes
crosoft Encarta 95 and
uicken SE. The unit had no
roblems on our software
mpatibility tests. It has a
e-year warranty with on-site
ervice.—*MEB*

P Pavilion 7090. Street price: 3,248. Hewlett-Packard Co., Palo Alto, CA.

...ian subsidiary Hewlett-Packard India, New ...ic partners CMS, Bombay; ECIL, Hyder-...k Godrej Trading, Bombay; HCL-HP, ...L, New Delhi; Zenith Computers, Bombay.)

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SUMMARY OF FEATURES

Home PCs

■ YES ■ NO
Products listed in alphabetical order

	Acer Aspire (PC MAGAZINE EDITORS' CHOICE)	AST Advantage! 818	Compaq Presario 9660	Dell Dimension XPS P166c	Gateway P5-166 (PC MAGAZINE EDITORS' CHOICE)	HP Pavilion 7090	IBM Aptiva A50
Price of tested configuration	$3,098 (street)	$3,305 (street)	$3,593 (street)	$2,999 (direct)	$3,837 (direct)	$3,248 (street)	$3,878 (list)
Processor	Pentium/133	Pentium/133	Pentium/166	Pentium/166	Pentium/166	Pentium/133	Pentium/150
Installed/maximum RAM	16MB, 128MB	16MB, 128MB	16MB EDO, 128MB	16MB EDO, 128MB	16MB EDO, 128MB	16MB, 128MB	16MB EDO, 128MB
Hard disk capacity and interface	2.1GB Fast ATA-2	1.6GB EIDE	2.1GB Fast ATA-2	1GB Fast ATA-2	1.5GB EIDE	1.6GB EIDE	1GB Fast ATA-2
Graphics adapter	Integrated (ATI Mach64)	Integrated (ATI Mach64)	Integrated (S3 Trio 64V+)	Number Nine 9FX Motion 771	Matrox MGA Millennium	Integrated (S3 Trio 64V+)	Integrated (Diamond Stealth64 video 9680XGi)
Memory	2MB DRAM	1MB DRAM	2MB EDO RAM	2MB VRAM	2MB WRAM	1MB DRAM	2MB VRAM
Monitor manufacturer and model	AcerView 76is	AST Vision 5M	Presario 1510	Dell D1528-LS	Sony CPD-17F13	HP D3857A	IBM G70
Screen diagonal claimed/measured (inches)	17, 15.8	15, 13.5	15, 13.6	15, 13.8	17, 16	15, 13.6	17, 15.8
CD-ROM drive (speed and interface)	Mitsumi CRMC-FX600 (6X ATAPI)	Torisan CDR-S1G (4X ATAPI)	TEAC CD-56E (6X ATAPI)	TEAC CD-56E (6X ATAPI)	Wearnes CDD-620 (6X ATAPI)	Mitsumi CRMC-FX400 (4X ATAPI)	TEAC CD-56E (6X ATAPI)
Sound adapter	Creative Labs Vibra 16S	Crystal Lake CS4232	ESS Audio Drive	Creative Labs Vibra 16S	Ensoniq 9533	Crystal Lake CS4232	IBM MWave
Installed external RAM cache and type	256K asynchronous	256K asynchronous	256K asynchronous	256K pipelined-burst	512K pipelined-burst	256K asynchronous	256K asynchronous
Motherboard manufacturer	Acer	Intel	Compaq	Intel	Intel	Intel	IBM
Chip set manufacturer and model	ALI Aladdin	Intel Triton	OPTi ViperM	Intel Triton	Intel Triton	Intel Triton	OPTi Viper
BIOS manufacturer and version (or date)	Acer 2.0	AST 1.00.05.BU0Q	Compaq (12/1/95)	AMI A05	AMI 1.00.01CN0T	AMI 1.00.02.CAZL	IBM 8G2U36E
Expansion-bus slots	3 ISA, 2 PCI, 1 PCI/ISA	5 ISA, 2 PCI	3 ISA, 1 PCI, 1 PCI/ISA	3 ISA, 3 PCI, 1 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA	5 ISA, 2 PCI	5 ISA, 1 PCI, 1 PCI/ISA
Accessible drive bays (5.25", 3.5")	2, 1	3, 1	3, 1	3, 1	4, 1	3, 1	2, 2
Internal drive bays (5.25", 3.5")	1, 1	0, 3	0, 1	0, 2	0, 7	0, 3	0, 2
Power-supply wattage	145W	200W	145W	230W	145W	160W	145W
Parallel, serial, mouse ports	1, 2, 1	1, 2, 1	1, 1, 1	1, 2, 1	1, 2, 1	1, 2, 1	1, 2, 1
Speakers	Aurasound 3D (monitor-integrated)	AST	Compaq	Altec Lansing ACS5	Altec Lansing ACS400	Altec Lansing HP Audio System	IBM Multimedia
Microphone/Headphones/Joystick	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
Modem speed (data/fax)	28.8/14.4 Kbps	28.8/14.4 Kbps DSVD	28.8/14.4 Kbps	28.8/14.4 Kbps	28.8/14.4 Kbps	28.8/14.4 Kbps	28.8/14.4 Kbps DSVD
Setup poster/Getting-started video	■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Labeled ports/Color-coded cables	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Software							
Integrated suites	MS Works	PerfectWorks	PerfectWorks	MS Office	MS Office Pro for Windows 95, MS Works	MS Works	Lotus SmartSuite, MS Works
Windows front end	A.C.E.	None	Presario Gallery	None	None	Personal Page	Aptiva Guide
Reference	Blockbuster Video Guide, Family Doctor, Infopedia	Blockbuster Video Guide, Family Doctor, Mayo Family Clinic, Grolier's Multimedia Encyclopedia	Compton's Interactive Encyclopedia, Family Doctor	None	Mayo Family Clinic, MS Bookshelf 95, MS Cinemania 96, MS Encarta 96	MS Bookshelf 95, MS Encarta 95, MS Explorapedia: World of Nature	Blockbuster Movie Guide, Compton's Interactive Encyclopedia
Service and Support							
Standard warranty on parts/labor	3 years/3 years	1 year/1 year	3 years/1 year	3 years/1 year	3 years/1 year	1 year/1 year	3 years/3 years
On-site service included	1 year	1 year	90 days	1 year	1 year	1 year	1 year
24-hour, 7-day technical support	■	■	■	■	■	■	■

and the four-CD version of Silent Steel. It had no problems on our software compatibility tests.

Service includes remote diagnostic capabilities.—*Anush Yegyazarian*

IBM Aptiva A50. List price, $3,878. IBM PC Co., Somers, NY. *(Indian partner TISL, TISL Tower, Golden Enclave, Airport Road, Bangalore 560001. Tel.: 5262355; Fax : 5268344. Price : Rs 140,000.)*

Micron Electronics Inc.

P166 Home Pro MPC

The $3,876 P166 Home Pro MPC from Micron Electronics will fulfill your home or small office needs, but scratchy speakers may diminish the unit's appeal. The Pentium/166 Home Pro netted some of the best test scores in this roundup, which should please its target audience of power home users. Micron also markets the Home MPC line for experienced home users, and the Millennia line of business PCs.

A setup poster, manual, and labeled ports guide you through setup. An Online Help guide has answers to frequently asked questions, highlighted by [illegible] action how-to videos instructing users on [illegible] installation and removal.

The unit's software bundle includes Microsoft Office Professional, [illegible] reference

REPORT CARD
Micron P166 Home Pro MPC

Setup	B
Performance	C
Sound	C
Edutainment	B
Productivity	B

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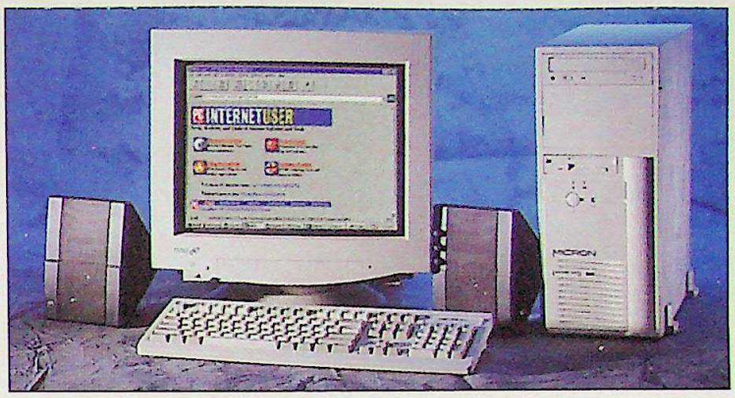
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	Micron P166 Home Pro MPC	NEC Ready 9552	Packard Bell Designer Tower	USA Flex Multimedia Classic
	$3,876 (street)	$3,498 (street)	$2,998 (street)	$2,895 (direct)
	Pentium/166	Pentium/150	Pentium/133	Pentium/133
	32MB EDO, 128MB	16MB, 128MB	16MB, 128MB	16MB EDO, 128MB
	1.3GB Fast ATA-2	1.5GB EIDE	1.6GB EIDE	1.5GB EIDE
	Diamond Stealth64 Video VRAM 3240	Integrated (S3 Trio 64V+)	Integrated (Cirrus Logic CLGD 5440)	Hercules Graphics Terminator Pro PCI
	2MB VRAM	2MB DRAM	1MB DRAM	2MB VRAM
	MAG InnoVision DX17T	NEC MultiSync XV15	Packard Bell 1512SL	MAG InnoVision DX17F
	17, 16.3	15, 14.5	15, 13.5	17, 16.5
	Sony CRD-256P (6X ATAPI)	Sony CDU76E (4X ATAPI)	Matsushita CR581 (4X ATAPI)	Acer 665A-002 (5X ATAPI)
	Creative Labs Sound Blaster AWE32	NEC MediaHarmony	Packard Bell	Intel
	256K pipelined-burst	256K pipelined-burst	256K asynchronous	256K pipelined-burst
	Micronics	NEC/BCM	Thousand Oaks	Intel
	Intel Triton	Intel Triton	Intel Triton	Intel Triton
	Phoenix 4.04	AMI 1.00.03.CQOZ	AMI 1.00.03.CP0R	AMI 1.00.04.CB0
	1 ISA, 3 PCI, 1 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA	2 ISA, 2 PCI, 1 PCI/ISA	2 ISA, 3 PCI, 1 PCI/ISA
	3, 1	3, 1	3, 1	3, 2
	0, 2	0, 2	0, 1	0, 2
	200W	200W	200W	230W
	1, 2, 1	1, 2, 1	1, 1, 1	1, 2, 0
	Advent AV370	NEC	Packard Bell	Altec Lansing Satellite 31
	28.8/14.4 Kbps DSVD	28.8/28.8 Kbps DSVD	28.8/14.4 Kbps	28.8/14.4 Kbps
	MS Office Pro for Windows 95	MS Works for Windows 95	MS Works	PerfectOffice
	None	None	Navigator	NoneReference
	MS Bookshelf 95, MS Cinemania 96, MS Encarta 95, MS Encarta 96 World Atlas	MS Encarta 95, MS Explorapedia: World of Nature	Mayo Family Clinic, MS Encarta 96	Compton's Interactive Encyclopedia, Family Doctor, Infopedia
	3 years/1 year	3 years/3 years	1 year/1 year	3 years/lifetime
	1 year	1 year	1 year	1 year

CyberWorks software to your 28.8/14.4-Kbps voice dem into a full-duplex akerphone. A 17-inch mon- and Microsoft's Sidewinder joystick—a $79 option in- ded in the price above— e with the unit.

The unit earned the top k WinMark 96 score in our ndup thanks to its 1.2GB antum Fireball hard disk. Its other test results were average to above average, due to powerful components such as 256K of pipelined-burst L2 cache and a Diamond Stealth Video VRAM 3240 graphics card with 2MB of VRAM.

Software compatibility tests showed no problems, but our subjective sound tests evinced significant distortion at high volumes.—*David Lidsky*



P166 Home Pro MPC. Direct price: $3,876. Micron Electronics Inc., Nampa, ID. *(No Indian partner.)*

NEC Technologies Inc.

Ready 9552

As its name asserts, NEC's $3,498 Ready 9552 is indeed a ready and able 150-MHz Pentium PC. It offers competitive performance, setup help for beginners, and great games software. NEC also markets two PowerMate corporate lines: the entry-level V series and the high-end P series.

NEC's documentation is illustrated and easy to follow; online help is thorough and system-specific. Many of the unit's functions, such as its graphics subsystem, based on an S3 Trio 64V+ chip set and 2MB of DRAM, are integrated on the motherboard.

This minitower features a front-mounted infrared port and a remote control. The remote can operate the PC's telephony functions; it also sends commands to the Sony quad-speed CD-ROM drive and to the NEC MediaHarmony combination card, which includes a 28.8-Kbps DSVD modem and a 16-bit audio chip set with wavetable synthesis.

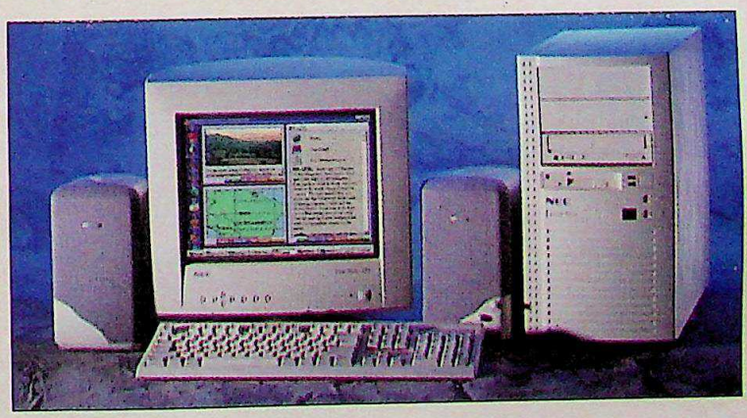
Verbex Voice Systems' Listen for Windows 2.0 allows the Ready to receive verbal commands and perform basic Windows functions. The unit also includes Radish Voice View software, which allows the user to transmit data and voice information simultaneously.

NEC's software bundle mixes excellent game titles like Activision's Pitfall and Delrina's Echo-Lake with Microsoft Encarta 95 and Intuit's Quicken SE Multimedia. The unit did well on most of our software compatibility tests but could not

REPORT CARD

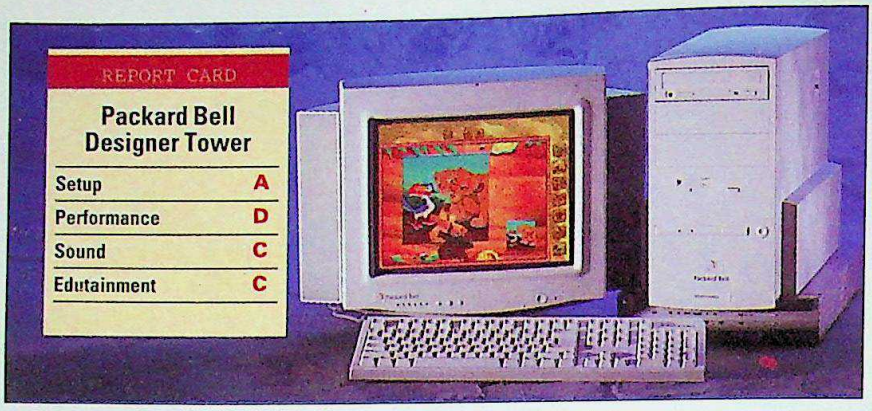
NEC Ready 9552

Setup	A
Performance	C
Sound	B
Edutainment	A
Productivity	B



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load one of the titles.

The Ready is equipped with two NEC 3-D stereo surround-sound speakers, a 15-inch NEC MultiSync XV15 monitor, and a 1.5GB hard disk.

On our benchmark tests, the Ready posted above-average Disk WinMark 96 and Graphics WinMark 96 scores for the group. Most of its other test scores were average.

NEC offers a three-year warranty with one year of on-site service. Remote diagnostic support is included.—*RSA*

Ready 9552. Street price: $3,498. NEC Technologies Inc., Mountain View, CA.

(Indian partner Byte Systems, 2/2A Ho Chin Minh Sarani, Calcutta.)

Packard Bell Electronics Inc.

Packard Bell Designer Tower

The $2,998 Packard Bell Designer Tower offers lots of help for first-time users—from its step-by-step instruction posters to Navigator, a well-developed front end that will guide you through use of your PC. It also comes with some good software to keep you entertained and productivity titles to help you work. This Pentium/133-based machine's performance, however, was poor. Packard Bell also offers the Corner Computer for the home, which is distinguished by a triangular case.

With the aid of the setup poster and color-coded cables, getting your minitower PC up and running is a snap. Packard Bell's Navigator will help you find your way around and offers tutorials. One of the unit's other convenient features is its remote control, which can act as a mouse substitute, play your quad-speed CD-ROM drive, or start applications.

The system comes with a 15-inch monitor, integrated 16-bit sound, and a 28.8/14.4-Kbps data/fax modem with a distinctive ring feature. The unit also includes Call Center, an easy-to-use communications package that turns your PC into a fax and answering machine for multiple users, and full-duplex speakerphone. The machine's speakers attach to the monitor.

Most of the unit's test scores were below average for its CPU group. It used asynchronous L2 cache instead of faster synchronous cache and an older 32-bit Cirrus Logic graphics chip set; all other PCs had 64-bit chip sets. Its 1.6GB hard disk has a slow rotational speed and could not keep up with others tested. Its CD-ROM WinMark 96 score was average, however.

Packard Bell bundles its own Internet browser and titles such as Microsoft Encarta 96, Quicken SE, Silent Steel (a game), Sports Illustrated Multimedia Almanac, and My First Encyclopedia. The unit did fairly well on our software compatibility tests.

The unit has a one-year warranty with one year of on-site service.—*AY*

Packard Bell Designer Tower. Street price, $2,998. Packard Bell Electronics Inc., Sacramento, CA.

(Indian partner HCL-GA, A 10-11, Sector III, Noida 201301. Tel : 521173/93; Fax : 550923.)

USA Flex Inc.

Flex Multimedia Classic

Aimed at more experienced users buying their second or third PC, the Pentium/133-based Flex Multimedia Classic from USA Flex is an above-average performer with a good software bundle and a competitive direct price of $2,895. The company also offers the Flex Business Workstation, aimed at corporations and businesses.

USA Flex provides some setup help: It packs a 12-step setup poster that includes a checklist of what you should find inside the box. The ports are also clearly la

The unit comes with a tensive bundle of so with titles such as 95 T manac, Novell's Perfect and Compton's Inter Encyclopedia 1996. The tem had no problems o software compatibility te

The Multimedia Cla equipped with powerful ponents such as a 1.5GB disk, EDO DRAM, 25 pipelined-burst L2 cache a Hercules Graphics Ter tor Pro PCI 2M card wi S3 Vision968 chip set 2MB of VRAM. A 17 MAG Innovision monitor Acer CD-ROM drive, 1 sound card, and a 28.8 Kbps data/fax modem plete the package.

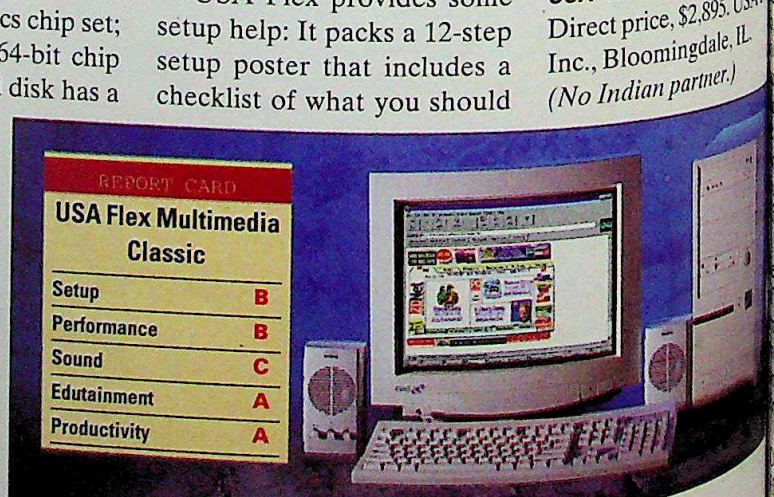
The unit's well-c components paid off: It o tently dominated its CPU on our tests, and its s were even strong enou rate above average for th tire group, which includes MHz systems.

Our sound jury found Altec Lansing Satellite speakers and Intel sound slightly below average bec of some breakup in bass.

The unit has a three parts, lifetime labor warr and one year of on-site vice.—*MEB* □

USA Flex Multimedia Cla Direct price, $2,895. USA F Inc., Bloomingdale, IL.

(No Indian partner.)



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Home PCs in India

Home PCs are coming into their own. They have something tangible for every member of the family, and they release the professional from the obligation of reporting to office on time.

More and more vendors in the country are introducing PCs for the small-office-home-office, in the hope that this nascent market segment with a very high projected potential will fetch them rich dividends. The success of home PCs depends on a large number of formal factors, including the emergence of heterogeneous class of independent professionals who would benefit immensely from working from home, too, rather than from office premises alone. These include doctors, lawyers, tax consultants and auditors, architects, interior decorators, stock brokers, managers, businessmen, software engineers, and consultants. If you add to their specific requirements the education and entertainment needs of their children, and the kitchen and other household needs of their wives, you have an explosive market situation in which home PCs with integrated communications and multimedia facilities can thrive.

Home PCs in the country attach maximum importance to the education and entertainment requirements of students. There is emphasis on CD-ROM titles on virtually subjects taught in schools and colleges, and vendors are vying with each other to provide effective education titles free with their systems. There are titles for all age groups, including the three-plus group, which can learn only through visual representation. On the entertainment side, there are effective attachments for enjoying stereo, video and films. Most vendors offer a liberal selection of games on CD-ROM to entice buyers. Of course, the minimum requirements of the small office like fax, e-mail, accounting software, spreadsheets, wordprocessors, and so on, are also attended to. Each vendor also offers a sparse sprinkling of software for the lady of the house.

Shiv Nadar, chairman, HCL group believes that in the next five years, the small office, home office (SOHO) sector will attract a million PCs. This and similar optimistic projections have tempted many Indian vendors to announce their own brands of home PCs.

BeanStalk, a home PC launched by New Delhi-based HCL Frontline, a member of the HCL group, was designed to function primarily as a learning tool, though HCL Frontline claims that it also addresses the special requirements of other members of the family. Children for instance, can learn from the computer via information stored on CDs, by interacting with people from a variety of backgrounds on a bulletin board service, and through syllabi-based software and creative tools. The housewife has a variety of titles at her disposal on subjects including cooking and family medicine. The system can also help her in budgeting for the household. To develop BeanStalk, HCL Frontline struck partnership relationships with some of the top names in the industry. BeanStalk is available in three basic configurations—low-end, middle, and high-end.

S. Premkumar, CEO, HCL Frontline, feels that the home computer user's expectations are very different from those of a corporate user. Education, entertainment and on-line services will be the main users of PCs at home. A vendor must be like a virtual corporation, providing an integrated product of the latest software and hardware to provide solutions for this segment.

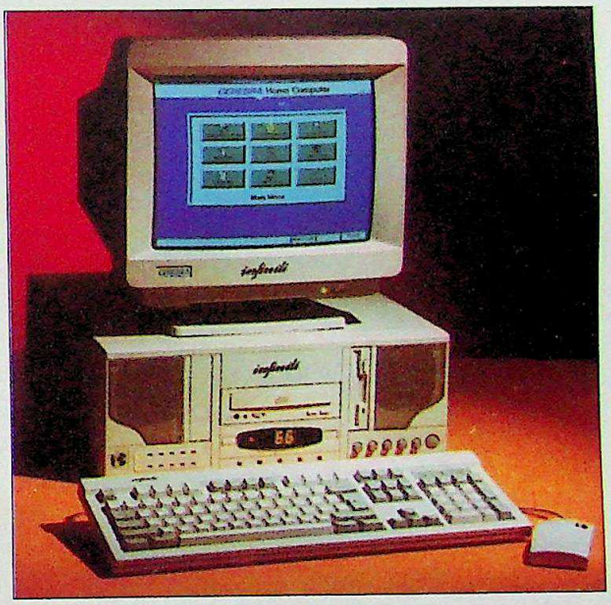
Cerebra Integrated Technologies of Bangalore has a home computer called Infiniti, which targets the complete information, entertainment, and education needs of all the members of the house. In its full-blown form, Infiniti can function as an integrated gadget that combines the TV, CD player, stereo amplifier, karaoke, FM radio, fax machine, high-speed modem, answering machine, address and phone book, appointment scheduler, automatic telephone dialer, and e-mail facility with Internet access. It can also function as a powerful and versatile PC with spreadsheet, database management, wordprocessing, and other software. Features include SoundBlaster capability, TV tuner for receiving TV and cable TV, CD-ROM drive for audio and video CDs, 14.4 Kbps fax, 19.2 Kbps modem, digital voice mail boxes, digital answering machine, and auto dialer facility.

The Indian subsidiary of Compaq Computer Corporation offers the Pressario 5500 and 9000 systems, which are powered by Pentium processors. They incorporate quad-speed CD-ROM drives, high-speed modems, up to 1.06 GB hard disk drives, and more than 10 software titles on CD-ROM.

The Pressario home computer line integrates six devices into one—computer, fax machine, telephone answering machine, home stereo, CD player, and a data modem. The systems are equipped with TrueQ Audio and Motion technology, and an intuitive interface called Pressario Gallery.

Other vendors offering home PCs include PCL and Apple (read about Apple's latest Performa 6300CD in the Indian Product Section of this issue).

The market for home PC-specific software is also growing with some companies offering utilities and packages that cater to the unique requirements of home PC users. JK Technosoft, for instance, offers an entire range of utility software for personal use from Global Software Publishing (GSP). These include an electronic cook book called Instant Recipes; a wine recognition utility called Wine Cellar; a program that helps categorize video collections and tape details called Video Library; a software on car maintenance called Motoring Expenses; an interesting software for keeping track of family history called Family Tree; a loan analysis package called Loan Analysis; a small contact manager called Address Book; a glossary of quotations called Quotes & Clippings; an expense monitoring package called Business Expenses; a purchase monitoring package called Purchasing Manager; a set of 20 unusual TrueType fonts for children called Kids Font; 100 designer fonts; and clip art.





—Hirendra Chatterjee

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MICHAEL J. MILLER

Why Buy a Perfect PC?

If you're like many of us here at *PC Magazine,* when you get an issue like this one you immediately begin to pore over the specifications for the latest computers and ponder which ones would be nice to own. You sift through the hardware and software reviewed in First Looks, looking for products that will help you be more productive, will be interesting to look at, or just look like fun.

Somewhere along the line, you talk about these things with friends. And inevitably, people are bound to overhear you discussing the pros and cons of the latest PCs, and they'll shake their heads as if to say, What's the point of all this? To the typical *PC Magazine* reader, this might seem like sacrilege, but to the world at large, it's a valid question. Why bother looking for the latest and greatest computer products? Why agonize over which computer to buy? Who really needs the Perfect PC?

After all, you can write documents, create budgets, play games, and connect to the Internet from just about any PC nowadays. And no matter what you buy, someone will have a faster, better model next year. Besides, we're talking about a computer, not world peace or a cure for cancer.

To be honest, these arguments have an element of truth. Most of today's machines are quite capable of performing the majority of the tasks users require. Nevertheless, there are a variety of reasons why you should care about which computer products you buy.



THE PERFECT BUY

Let's face it: A PC is a big purchase, and choosing the right one makes a big difference.

The first reason is that you need to choose the right kind of machine for your specific needs. Although personal computers have a lot in common with one another, the term "PC" has been broadened to include anything from a battery-powered device you can fit in your shirt pocket to a multiple-processor server you lock in a climate-controlled room. Among the mainstream computers we looked at for this issue, for instance, we came up with 10 primary categories, ranging from desktops to notebooks to servers. Even within those categories, there is a lot of variation. Consider home computers: Some are designed for general use, while others are designed for specific tasks such as running a home business, providing the ultimate in gaming, or even serving as the family's entertainment center in the living room.

Once you've narrowed it down to the appropriate category, you must still grapple with differences in CPUs, graphics quality, and expandability. Finally, there are the less tangible characteristics of individual brands, such as the quality of construction, warranty, and level of technical support.

Let's face it: A PC is a big purchase, and choosing the right one can make a big difference. In fact, for many home users, a computer may well be a family's third-largest expense (after housing and transportation). Buying the right one now may mean it will last longer, cause fewer headaches, and cost less in the long run—especially for businesses that purchase many PCs at a time. Just as important for businesses are questions of compatibility, expandability, and management, because in many companies, hardware expenses are only a fraction of the total cost of managing and supporting computers.

And yes, part of the reason we care so much is that for many of us, it's just plain fun. We like computers. We think finding one that does more, works better for us, or breaks new technological ground is interesting. In a way, it's like transportation. True, anything from a Corvette to a Caravan will get you to the supermarket and back. But the Corvette won't hold too many grocery bags—let alone transport a family of five or haul lots of building materials. That's why you need to choose from the category that's right for your needs: sports car, sedan, station wagon or minivan, truck, or sport-utility vehicle. Even within these categories, there are substantial differences in such areas as performance, comfort, reliability, and image. The same concept is true of computers.

But in a way, computers are unique, because they can help us do so many different things. They may make us more productive at work, but they can also be a fun way to pass time playing games. Computers are ushering in a new era of education and learning, helping our children in ways we're only beginning to grasp. And though computers alone cannot cure cancer or prevent war, they play integral roles in medical research and in keeping the peace by fostering communication across political and geographic boundaries.

Nobody's perfect. Ultimately, there's no such thing as a Perfect PC either. But does that mean we should stop trying to find it? No way. □

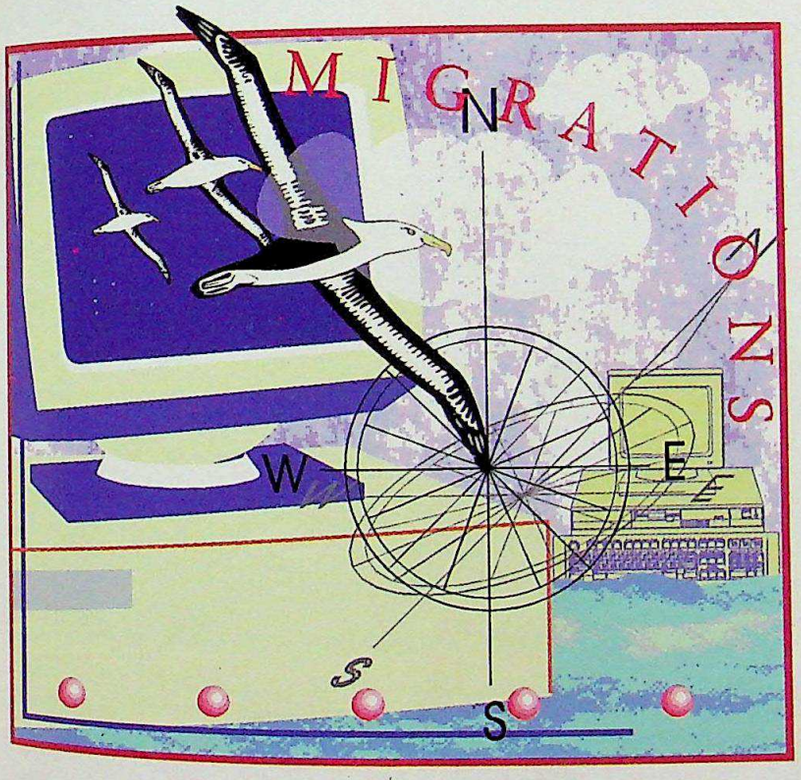
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THE BEST NOTES SERVER

Notes Migrations

A new version of Notes and stronger server OS platforms inspire fresh thoughts of migration among Notes administrators.



By Tony Pompili

Just when you thought it was safe, Lotus Development Corp. has shipped Notes Release 4—to cheers and sighs alike. With Release 4 comes a swarm of new system-configuration options and features, including a variety of Internet access options, further confirming Notes as the premier groupware and messaging system on the market. (Cheers.) A large base of users, sometimes feeling trapped in the standing OS/2-based server architecture, are taking a good hard look at some fresh options as migration to

INSIDE

PC MAGAZINE

There is good news for the more than 45 million Notes users and the administrators who oversee the 30,000 Notes servers in production. Administrators who support roughly 60 to 70 users per server are helping to consolidate many of these servers into fewer boxes. They want to reduce administration costs and space as they improve performance.

MIGRATING TO RELEASE 4

Release 4 is tempting. Yet, competitors in the messaging and application arena, such as Microsoft Exchange Server 4. 0 and Netscape's SmartSuite, challenge Notes. All this makes the move to Release 4 an even bigger consideration.

OUR LOTUS NOTES expert, consultant, and contributing editor tony Pompili led the test charge. We cranked up the ZD Labs 300-node PC LAN lab to test the mettle of four OS platforms as a base for a departmental Notes server. Pompili also designed tests meant to crack the OS platforms. But crack they did not. Even with a spanking new release of Notes on fresh OS platforms, they all did pretty well.

EXECUTING PERFORMANCE runs for testing on this scale takes considerable planning, coordination, and time. Helping Pompili out at the Labs were PC Magazine project leaders Alex Ho and Jeff Witt, with support from Amy Leang. Russ Iwanchuk, Anatoly Nosovitsky, and Andrew Go. Read on for the results of so many weeks of banging on servers.

-Gail Shaffer

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Release 4 becomes a strategic goal.

But with all of the choices, which—if any—new Notes server platform should you move to? (Sighs.) The *PC Magazine* test team put ZD Labs' 300-node PC LAN lab into full use to give you an idea. Again this year, we tested four Notes OS platforms as departmental servers: Notes Server editions for Novell's NetWare, IBM's OS/2, SunSoft's Solaris, and Microsoft Windows NT (single and multiprocessor versions).

Migration is a nasty word, guaranteed to send shivers down the spine of any experienced Notes administrator. Moving from old versions to new without disrupting the day-to-day workflow of users is a tricky proposition. This is especially true when the move involves swapping out Notes server OSs and NOSs.

With 90 percent of the installed server base still running OS/2—a legacy based on Lotus's early attachment to OS/2 and the lack of competitive OSs around in the early 90s—Release 4 is an opportunity for Notes sites to reconsider their Notes server OSs. Release 4's benefits, including true 32-bit architecture and better exploitation of faster processors, are impressive. Replication, indexing, and routing processes—the big three in the Notes world—all have been rewritten to reduce server processing time and increase server performance. Features such as field-level replication help to minimize the volume of data to be replicated.

IS RELEASE 4 FOR YOU?

Release 4 is tempting, to be sure. Yet competitors in the messaging and application arena, such as Microsoft's Exchange Server 4.0 and a slew of products from popular Internet software companies such as Netscape's SpotSuite, challenge Notes. All of this makes the move to Release 4 an even bigger consideration.

Our testing reveals that migrating from Release 3 to Release 4 is worth more than just a glance. Across the board, on all of the platforms tested, we found greater capacities, faster processing times, and better client performance than we did last year when we tested Release 3 servers.

Granted, we ran heartier server hardware this year (133-MHz Pentiums with 256MB of RAM versus last year's primarily 66-MHz Pentiums with 128MB of RAM). But Release 4 code and true 32-bit architecture, as well as improved threaded implementations on platforms such as Solaris, make even better use of the hardware.

This is good news for the more than 4.5 million Notes users and the administrators who oversee the 30,000 Notes servers in production. Administrators, who support roughly 60 or 70 users per server, are hoping to consolidate many of these servers into fewer boxes. They want to reduce administration costs and space as they improve performance.

In fact, with some of the hardware out there now, we expect to see substantial reduction in the number of boxes deployed. For example, Sun Microsystems, with its new Ultra Enterprise 3000 servers (with as many as six processors), expects to be able to support nearly 2,000 active sessions on a single super-server. (Cheers.)

That's impressive. And it's likely the wave of the future for some sites. For this roundup, *PC Magazine*—after consulting with several large Notes customers—instead focused on the more common departmental server. Though it supports fewer users than a super-server configuration, we pictured a Release 4 departmental server with a capacity three to five times as great as a Release 3 server.

DEPARTMENTAL REDUNDANCY

Super-servers reduce server replication and box space in the server room by taking what would now be 10 or 20 conventional servers and condensing them into one. Departmental servers, however, take greater advantage of the de- centralized and distributed archite-

Lotus Notes Server for Windows NT

We saw tremendous improvement in some of these products over last year's crop. There isn't a bad one in the bunch. In large part, your selection—whether you're migrating from Release 3 to Release 4 or moving from one OS to another, or even if you're just setting up your first Notes server—will depend on your users' needs, your network capabilities, your in-house expertise, and your budget. Remember that we were assessing these products as OS platforms for departmental-size servers.

PC MAGAZINE EDITORS' CHOICE

In a field of good products, one did recommend itself above the others during testing as an excellent choice across most decision lines. Lotus Notes Server for Windows NT will serve you well in any situation.

Windows NT was the only platform available in an SMP version when we tested, and it certainly showed what a difference extra processors will make in your application server. SMP enabled Windows NT to best the more powerful Notes Server for Solaris, a very worthy product that earns an honorable mention. The Solaris box carries a considerable hardware price tag and the need for Unix expertise somewhere in your server's vicinity. But it's a clear choice if you plan a super-server out of the gate and you can handle the issues we raise.

Some other features of the Windows NT solution that you'll like are its familiar, easy-to-use interface and setup, and its broad support for network transport protocols (its troubles with IPX notwithstanding). It now rivals OS/2 in the latter department.

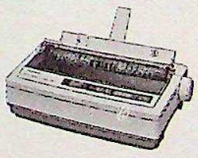
We still like the OS/2 solution for its maturity and the related advantages: There's lots of expertise out there and plenty of third-party add-in products. And we applaud the continued growth of the NetWare product for sites that want to stay NetWare-only. Both are solid choices.

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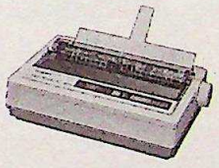
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Some like them quiet and SLEEK.
Some want it **RUGGED** and *EFFICIENT.*
Sometimes for professional reasons.
Sometimes *Personal* ones.
LIGHTWEIGHT preferred.
HEAVYDUTY needed.

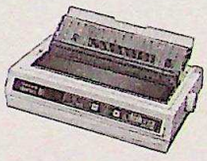
No problem.



KXP 1150. Compact front office printer



KXP 1121: High print quality correspondence printer



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Lotus Notes Platform Comparison

	Installation	Administration	Networking
Lotus Notes for Windows NT	Requires a minimum of OS configuration.	The Notes server can be installed as a Windows NT Service to be started and stopped automatically when the server is booted and shut down. The Notes administration program can run directly on the server.	Wide range of networking-protocol options. Poor IPX/SPX with large volumes
Lotus Notes for NetWare	Installation runs only on Windows 3.1. Requires manual configuration of the NSF buffer-pool size.	The Notes administration program must run from a network-connected PC.	Strong IPX/SPX compatibility. Works with the IPX/SPX 2 protocol.
Lotus Notes for OS/2 Warp Connect/LAN Server	Installs directly on the server under the Presentation Manager. Numerous OS configuration settings. Users must install LAN Server to handle large client loads.	The Notes administration program can run directly on the server.	Wide range of networking-protocol options.
Lotus Notes for Solaris	Uses text-oriented Unix installations. Requires the most OS/2 configuration and patches. Requires significant understanding of Unix.	The Notes administration program can run directly on the server.	IPX/SPX implementation does need the NetWare server for SA advertising. IPX/SPX software takes a Unix p to install.

ture for which Notes is known. A single departmental server out of commission won't bring down an entire site, since there's no single point of failure. Departmental servers will also fit well with Notes' upcoming server-clustering feature, expected in a future release.

In this year's roundup, Notes Server for Windows NT is again our Editors' Choice for the best departmental server platform. Release 4 on Windows NT installs easily and takes advantage of the platform's standard support for SMP; OS/2 and NetWare SMP support will require separate products. Moreover, its Windows interface is familiar to everyone.

We also give a nod this year to Notes Server for Solaris. The heavy-duty Sun multiprocessor hardware yielded some great test results. This may be your choice if you're jumping straight to a super-server setup. But buyer beware: The powerful Sun configuration still calls on Unix, which remains foreign to many Notes support staffs. Be prepared to do some retraining or possibly some hiring.

300 CLIENT PCs + 4 SERVERS =

The ZD Labs LAN lab was the perfect setting to try taxing the limits of Lotus's new release on four platforms. Running 300 active users on a single server seemed to be a fair test of a departmental Notes Release 4 server, based on input from Notes customers as well as Iris Associates, Lotus's development arm for Notes.

This configuration simulated a consolidation of three to five Release 3 servers onto a single Release 4 server. During our testing, all users were active all the time, but it is rare that all users hit on the server simultaneously. So our 300-user departmental server could realistically handle a 900- to 1,500-user Notes community.

Generally speaking, each Notes platform far exceeded its performance of last year. Servers in our routing tests, meant to simulate a mail or messaging server, could easily handle the 300 users with absolutely no degradation in client or server performance. All of the servers could connect the 300 clients simultaneously, with the exception of Notes for OS/2.

We initially ran the server on OS/2 Warp Connect, since OS/2 Warp Server was not yet certified for Release 4 (this was strange, considering that IBM

Fact File

Lotus Notes Release 4 Server for Microsoft Windows NT, for NetWare 4.1, for OS/2, and for Solaris. **Lotus Notes Release 4 Client** for Microsoft Windows NT, for NetWare 4.1, for OS/2, and for Solaris. List price: Notes Mail, $55 per license; Notes Desktop, $69 per license; Notes, $275 per license; Notes Single Processor Server, $495; and Notes Multiprocessor Server, $2,295. Lotus Development Corp., Cambridge, MA
(Indian subsidiary Lotus India, New Delhi; partners ITC, Calcutta; Microland, Sonata, Bangalore.)

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Performance	Migration	Add-in processes	Bang for the buck
Good mail, routing, and replication performance. Dual-processor support makes Windows NT the best platform overall. Problems with client and server performance at increased client loads.	Simplest all-around platform for PC-oriented Notes sites. IPX/SPX limits the server to large departmental applications.	A wide variety of processes are available, with more coming.	Windows NT is becoming more prevalent. Many users already have experience with Notes Release 3. Easy retraining for many sites.
Good mail, routing, and replication performance.	NetWare sites will consider it a snap. No NetBIOS—a drawback for existing NetBIOS sites.	The platform is incompatible with most processes.	There are lots of experienced users out there. Not all Notes groups are currently up on NetWare servers.
Good mail, routing, and replication performance. Problems with client and server performance at increased client loads.	A natural for the majority of sites already running OS/2 2.2. Supports the fewest users of processor-intensive tasks like replication and indexing.	This is the primary platform for add-in processes.	Most sites are extremely familiar with OS/2. LAN Server and OS/2 Warp Connect must be installed to take advantage of the performance benefits of Notes Release 4.
Good mail, routing, and replication performance. Best single-processor performance.	Easy to use with the help of a Unix guru. Difficult to use without the help of a Unix guru. Minor database-index incompatibilities with Intel platforms.	Few processes are now available. Add-in processes are becoming available.	Best super-server option. Requires expensive proprietary Sun hardware. Most Notes sites don't have Unix-experienced users in their Notes departments.

has owned Lotus for some time now). We had to install IBM's LAN Server, that company's older file-server product, to enable all 300 client PCs to connect at the same time. Even Notes Server for NetWare, which during last year's testing bogged down as users were added, performed well as a messaging server.

OH, THOSE CLIENTS

The 300 client PCs comprised a combination of 486/66 and Pentium/133 systems, and all were running Windows 95 and SPX. We stayed with SPX (over TCP/IP) because of the widespread use of SPX to connect clients to Notes servers. Remember, the majority of clients are still on OS/2 2.*x* boxes sitting on NetWare networks that run IPX/SPX.

Although all four platforms support IP as well, we were following Lotus's recommended migration strategy of replacing servers first. Thus, we wanted to ensure that swapping a server would not interfere with network performance and would keep IT departments from having to add IP to every Notes user. This can be a most unpleasant task when you're dealing with hundreds or thousands of Notes clients.

Interestingly, our choice of SPX did indeed pinpoint problems, specifically on Notes Server for Windows NT, as we explain in our review. Iris reps say the company is not planning a fix for the problem because it believes that most companies will be moving to IP. Moreover, the NT SPX bottleneck problem is alleviated by adding a second processor on larger-capacity departmental Notes servers.

SERVICE FOR FOUR

On the server side, we used a Compaq ProLiant 4000, a 133-MHz system capable of running up to two processors for the three Intel-based OSs. Even the older technology of the 4000 served as a powerful platform for Release 4 servers. We had been hoping for more of an SMP shootout, but only the Windows NT server was available for two processors. The multiprocessor version of OS/2 Warp Server should be out by the time you read this. NetWare SMP for the ProLiant was out, but not certified to run with the FlexNet 100-Mbps NIC we used.

On the network side, our clients had 10-Mbps adapters, each connected to its own Cabletron switched-Ethernet port. The servers had 100-Mbps adapters, which is admittedly overkill since our test documents averaged about 5K. But the 100 Mbps did help during our server-to-server replication tests.

The popular Solaris from SunSoft was situated on an Ultra Enterprise 1 Model 170 with a 167-MHz RISC CPU. The multiprocessor version of the Ultra, called the Ultra 2, was not shipping in time for testing. Even in a single-processor configuration, though, Notes running on Solaris gave the Windows NT SMP combination a run for its money, with comparable performance on all of our tests.

Our testing methodology was similar to last year's. Not satisfied to monitor server performance only, we also measured client latency as the servers be-

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came loaded with users and server tasks. Lotus also offers its own testing methodology, which is available primarily to hardware vendors and tests only server-side performance.

One major departure from last year's test approach was our flexing of the Notes servers' ability to run multiple versions of processes. Our indexing and replication tests ran dual versions of each process. We increased our database size tenfold, with little difference in performance from last year. This is a good sign for all of those Notes hub servers out there that spend their day replicating across LAN, WAN, and dial-up connections.

WHAT IT ALL WILL COST YOU

Our recommendation of Notes Server for NT as the best departmental Notes server is based in part on cost. The Sun Ultra 1's list price is nearly 30 percent higher than the ProLiant's—even with two CPUs and the pricier $2,295 SMP Enterprise version of Notes Server for NT. Larger Sun systems, such as the multiprocessor Ultra Enterprise 2 and the larger Ultra Enterprise Servers, cost even more.

One area where you might cut some corners is RAM, especially for servers with fewer users. Across all platforms we found it was the processor that was bested far sooner than any other component of the Notes server. We also observed that during testing the NSF Buffer Pool never exceeded the default setting of 25 percent of available RAM—64MB of 256MB. On the average, little more than half of that, about 35MB, was ever used. Smaller businesses with servers supporting 100 to 200 active users can get away with 128MB.

The good news is that Release 4 servers offer significant performance improvements across the board. Each platform outperformed its Release 3 predecessor threefold.

We further believe that the competition in the Intel-based SMP market will heat up as products such as OS/2 Warp Server SMP appear this fall—and that Sun systems will get more competition for the high-end super-server market as products such as the Pentium Pros become more available.

For Notes administrators considering a server-for-server move to Release 4, we are confident recommending any of these platforms. But if you're considering consolidating servers, take a look at the following reviews of platforms to get an idea of what *PC Magazine* testing found.

Lotus Development Corp.

Lotus Notes Server for Windows NT

PC MAGAZINE EDITORS' CHOICE

With its familiar, user-friendly Windows interface and built-in SMP support, Lotus Notes Server for Windows NT is a powerful platform to be reckoned with. It's an excellent choice for new Notes sites or for sites looking for a change in their departmental Notes server. That said, it may not be

ANNOUNCEMENT

In supersession of our previous announcement, there will be two issues of *PC Magazine India* each month except in May and December, when there will be one issue each. As before, there will be 22 issues in a year.

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Platform Futures

By Tony Pompili

Most of the time, delivering *PC Magazine* testing results is like focusing on a handful of frames from a 2-hour feature film. Just about the time we finish our testing and go into writing and producing an article, a whole new set of products appear on the screen. What we publish is a snapshot. Products related to Notes Release 4 are no different.

As Notes administrators struggle to stay ahead of the curve, they'll be bombarded over the next few months by word of a whole new array of choices in hardware and software that could influence how their Notes server environment performs. Not surprisingly, our testing revealed that the new Release 4 server software benefits from three specific platform components: processor power, operating system SMP support, and network driver efficiency. New versions of software and emerging hardware platforms, specifically Intel-based boxes, could mean major performance gains at your own site.

The key element, as observed in testing, is processor speed. Release 4 has been written to exploit OS and NOS SMP capabilities better than its predecessor did. Not surprisingly, even platforms such as Windows NT 3.51, which ran into SPX bottlenecks, could achieve multifold performance improvements with just the addition of a second processor. So for the many OS/2 sites, it's probably worthwhile to keep an eye on the OS/2 Warp Server SMP, expected to ship this fall. Although OS/2 2.11 SMP delivered lackluster performance, servers equipped with Warp Server SMP could offer a significant performance improvement at existing OS/2 sites.

Microsoft, as usual, is not sitting still with its entry in the market. Currently in beta form, Windows NT Server 4.0 is expected to be available later this summer. Although many of Windows NT 4.0's enhancements are in its interface and its Internet functionality, it will inevitably become the platform on which you're likely to be running your Windows NT Notes server in the near future.

Remember, too, that faster servers are just around the corner. For the majority of shops committed to PC-based platforms, the newest hardware on the horizon is based on Intel's P6 (Pentium Pro) chips. Hardware expected from the major PC server vendors, including ALR and Compaq, will run at 166 MHz to 200 MHz. More important for SMP applications, systems with as many as four Pentium Pro CPUs are beginning to show up. Prices for Pentium Pro hardware will start at around $16,000 for basic configurations with a single processor.

for everyone. Sites with much larger server configurations that must use SPX may encounter performance problems with the combination of Notes and Windows NT.

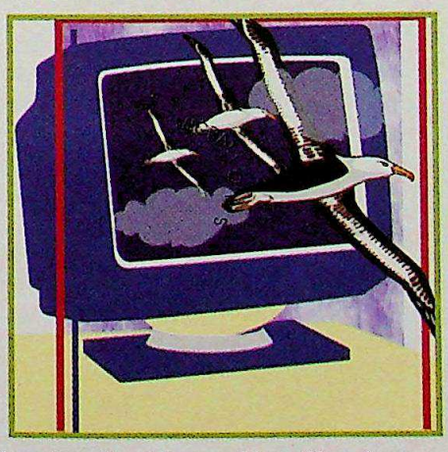
Even so, Notes Server for NT was the performance leader when we used its SMP capabilities to run over a dual-CPU system. And with a wide variety of networking options, including support for TCP/IP, IPX/SPX, NetBIOS, and AppleTalk, the Windows NT server rivals OS/2 in flexibility.

We tested Notes Server for Windows NT on a Windows NT Server 3.51 with Service Pack 4. For multiprocessor testing, we added a ProLiant P5-133 processor and replaced the uniprocessor kernel with the multiprocessor version. Notes Server for NT was the only SMP platform we tested, and we concluded that the version merits a serious look.

We found that most of our tests taxed the processor far more than any other system component (including disk array and memory). This was true for all platforms tested here. Adding the second processor provided more processing headroom for nearly all tasks, and especially for the Replication and Indexing tests.

As we increased the load in the single-processor configuration, we ran into a bottleneck. Of all the platforms tested, Notes Server for NT was consistently the poorest performer on our Replication and Indexing tests. We attributed the problem to the SPX implementation of Notes. Iris representatives agreed with our evaluation but said they were unsure whether the problem was with Notes or with a Windows NT driver. In any case, adding the second processor alleviated the bottleneck.

The Windows NT SPX bottleneck comes on the heels of another Windows NT problem that allowed only 380 SPX users to connect to the server. Microsoft



has since fixed that problem. If you're moving away from SPX, this is probably not an issue. But companies that want to stick with their existing client protocols while combining multiple Notes 3 servers into a few departmental Notes 4 servers should expect to see decreased performance, as compared with platforms such as Solaris.

Notes Server for NT was the simplest of these packages to install. It's as easy as changing two registry parameters, which tunes the Windows NT server as an application server rather than a file server. Aside from the basic IPX/SPX protocol, you'll also need to install the SAP Services and Gateway Services for NetWare, which are available on the standard Windows NT installation disks. The interface is identical to its Windows 3.*x* counterpart and will take on the appearance of Windows 95 when a new version of Windows NT becomes available this summer.

We tested Notes Server for NT as a standard application, but it can easily be installed as a service with a simple installation program supplied by Lotus. As a Windows NT service, the Notes server automatically starts and stops when the Windows NT server is brought up and down.

Notes is still pretty independent of Windows NT. Unlike Microsoft's own client/server messaging product, Exchange Server 4.0, the Notes server does not use Windows NT user information, so there is no way automatically to set up new Windows NT file server users as Notes users. Network administrators building Windows NT–based LAN infrastructures may find this cumbersome. The vast majority of sites considering Notes for NT probably will not be affected by this lack of integration, however, because they will be clinging to NetWare file servers for a while.

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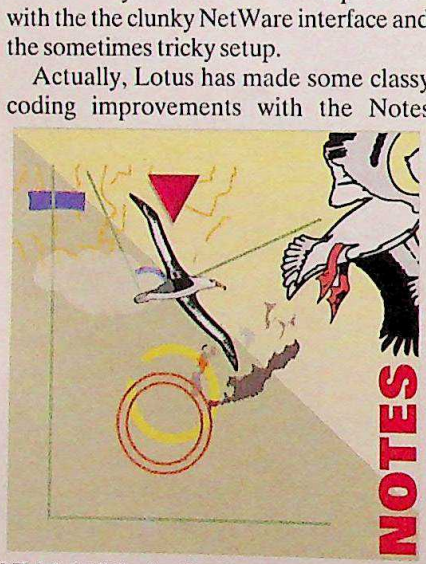
Windows NT is an excellent Notes solution for departmental-size platforms. A familiar interface and built-in SMP support make it even more attractive as an addition to the PC LAN server room. A second processor is key to avoiding SPX performance problems and adds significant headroom to the server. For those of you considering the move from OS/2, Notes Server for NT should be your destination.

Lotus Development Corp.

Lotus Notes Server for NetWare 4.1

Boasting impressive performance improvements over Release 3, Lotus Notes Server for NetWare 4.1 will appeal to organizations that want to piggyback Notes onto their existing infrastructures. But you'll need to have patience with the the clunky NetWare interface and the sometimes tricky setup.

Actually, Lotus has made some classy coding improvements with the Notes NLM. Still limited by NetWare's relatively flat OS environment, Notes Server for NetWare overcomes many of the pitfalls of its predecessor. We were most impressed by its ability to balance processes and loads—something Release 3 struggled with during our testing last year. Notes Server for NetWare rivaled the other platforms' performance on our CPU-intensive replication and indexing tests.



Still, Notes Server for NetWare sports none of the preemptive, multitasking OS features offered by OS/2, Solaris, and Windows NT. This version of Notes, which is loaded as a series NLM, is more cumbersome to administer and a bit more difficult to set up than Notes under Windows NT or OS/2.

In addition, though the other platforms in the roundup began shipping in January, Notes Server for NetWare was released just as we began testing. At test time, neither the Compaq NetFlex 3 netword adapter nor the NetWare 4.1 SMP for the ProLiant had been certified, so we were able to look at only the single-processor version. We found that while NetWare still tends to be less forgiving in its allocation of processor power and resources, it nonetheless worked well in our departmental server configuration.

For example, during our index testing, the index process timing rose relatively predictably while the other two Intel-based systems—OS/2 and Windows NT—both increased more dramatically. The downside is that client performance suffered a bit. The NetWare server is a slightly slower database and replicating hub server. As a mail server, NetWare seemed undaunted even by our 300 clients. We witnessed no server degradation and little client degradation from 1 to 300 users.

On the networking side, Notes Server for NetWare was of course at home handling SPX. Its SPX strength makes it an easy replacement server for the many OS/2 2.1 servers now running Notes.

The NetWare version is still a less intuitive Notes server to set up and administer. First, you install it remotely over a networked PC. This is an unwieldy method compared with what we saw with the other platforms we reviewed, which let you install the Notes server and a client directly on the server. In addition, you need to install from a Windows 3.*x* PC with a Notes client previously installed, because the install program doesn't run correctly on Windows NT, Windows 95, or OS/2. According to Iris, the install program relies on NetWare's Windows 3.*x* drivers to confirm that it is correctly connected to a Notes server.

We tested NetWare on a NetWare 4.01 server, but the NLMs will run on a NetWare 3.12 server as well, according to Lotus. As recommended, we installed the latest NetWare patches, STRTL4.EXE, 410IT6 .EXE, and 410PT3.EXE, to improve IPX/SPX performance. We also set a few Novell-supplied NetWare Set parameters.

Limitations in NetWare make Notes server setup a less-than-automatic process. For example, our tests used the Notes default NSF buffer pool size of 25 percent of the available memory. For each of our platforms, this amounted to roughly 64 Mbps. Because the Notes server application has no way of querying the NetWare server for available memory, we had to set the NSF buffer pool size manually in the NOTES.INI file.

Administering Notes Server for NetWare at the server console is a similar process. Other administrative tasks such as modifying network or port settings or performing database maintenance have to be done from a networked PC. Further, modifications to the address book can be done only when the Notes server is down, making on-the-fly changes almost impossible.

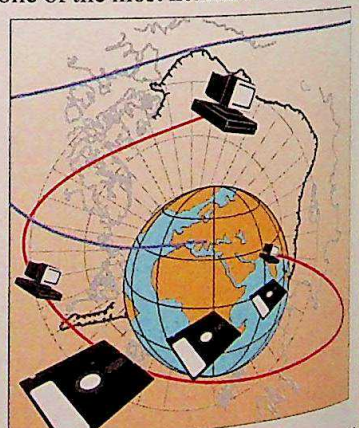
A much-improved Notes server over Release 3, Release 4.1 for NetWare ranks up there with OS/2, Solaris, and Windows NT. If you don't mind the interface and quirky setup, this NetWare solution offers greater capacity and competitive performance.

Lotus Development Corp.

Lotus Notes Server for OS/2

The favorite son of the Notes community, Lotus Notes Server for OS/2 faces some fierce competition in this year's comparison. Although Notes Server for OS/2 far exceeded its predecessor (Release 3) in testing, it fell short of surpassing the other platforms. Nonetheless, OS/2 is still the most popular platform for Notes and offers some of the most wide-ranging networking features. All of this makes migrating to Release 4 a pretty simple task.

With greatly expanded capacity, Notes Server for OS/2 maintains its reputation as one of the most flexible Notes server platforms. Everything from mail gateways to the Internet Web Publisher runs on OS/2. And it is one of the only platforms to support TCP/IP, IPX/SPX, and NetBIOS.



It is not infallible, though. It began to show its breaking point with heavier loads during our testing, and it was the only platform unable to complete the replication test. Lotus and IBM attribute the problem to limited disk-cache buffering. But although the combination of Notes with OS/2 may not be the best way to handle extremely large numbers of users, our testing shows it is still a powerful server for between 200 and 250 active users.

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What's Next for Notes

By Tony Pompili

As if the current Notes Release 4 offerings don't make your migration decision confusing enough, Lotus is about to unleash two new upgrades that will add greater flexibility to your Notes environment. These separate forthcoming versions promise to make Notes more accessible to Web-browser users and provide end users with competitive calendaring and scheduling applications. These new server options will also, for the first time, enable Notes administrators to set up inexpensive, fault-tolerant servers.

The first round, Release 4.11, will include the much bally-hooed integrated Notes and Web server. The Web server feature will provide access to generic Internet and intranet Web browser users. Release 4.11 will enable Notes servers to convert Notes databases to HTML pages on the fly. Now, as document, view, and Notes Navigators get converted in real time, browser users will work with more accurate information. But this is still not the anticipated standalone Web server; that will come later.

Release 4.11 is expected to be available by the time you read this. It will make Web versions of Notes databases more dynamic for Web-browser users. Release 4.11 will also enable browser users to create new documents and Web users to edit and delete existing documents. New and edited documents can be saved directly to Notes databases for later viewing by other browser users, as well as by proprietary Notes client users.

View manipulation will also be greatly improved. Like documents, Notes Views or summary lists of documents will be translated to HTML documents in real time. Documents listed in Views will have HTTP links that allow users to click and navigate to HTML pages. Release 4.11, which was code-named Domino, will, in addition, dynamically update Views as new documents are added, deleted, or modified by Notes or Web browser users. Another new feature in 4.11 is that, like Views in Notes, browser Views can be collapsed and expanded under categories, so that users can more easily locate pertinent documents.

Security for browser users will become more like Notes security with Release 4.11. The Notes database Access Control List (ACL) can be applied to browser users as well. In the Notes world, the ACL defines the level of database access for users—that is, whether they are allowed to create documents, allowed only to read documents, or not allowed to access the database at all. When browser users log on, their passwords and user names are checked against the ACL, and they are given the designated access rights. Although browsers do not permit the same certificate-based security that Notes clients and servers do, the ACL does add another level of access control to the Notes server currently available from Netscape in its new FastTrack 2.0 Web server.

Generally, Notes Release 4.11 will also support Web frames, assuming the Web user's browser supports them. This allows Notes databases using multipane designs, such as documents with static Action bars, to reproduce facsimiles of these interfaces for browser users. Web users will also be able to launch Notes Agents, or macros, to perform tasks such as updating or printing a series of Notes documents.

Real-time full-text searching will also be possible on Notes databases. Web browser users will be able to tap into the Notes full-text search engine and locate documents for any Web-accessible Notes database that has been full-text–indexed.

Release 4.11, though ambitious, will still have a few holes, especially in the area of data access. It will support only CGI (common gateway interface), enabling the integrated Notes Web server to talk with outside applications; JavaScript and other third-party server interfaces such as Netscape API or Microsoft ISAPI will not be available. DBLookup and DBColumn, two common Notes development functions, will not be supported either.

> A second release of Release 4 is expected to turn any true Web server into a Notes server environment.

THE DOMINO EFFECT

This fall, a second release of Release 4 is expected to turn any full-fledged Web server into a Notes server environment. This will allow browser users to access not only Notes databases but any HTML page located on the Notes server. Code-named Domino 2, this release also enhances server reliability and provides end users with calendaring and scheduling applications.

Probably the most interesting architectural change since Notes servers came on the scene six years ago is Notes server clustering. Clustering will give administrators fault-tolerant server capabilities. Users on clustered servers will be able to remain connected to open databases; disruption will be minimal should a server go down.

Notes server clustering relies on Notes' inherent database replication capabilities and server-switching software. A clustered server will have replicas of its databases on fellow servers within the cluster, providing database backups. Should a server fail, Notes client software will sense the outage and redirect itself to the clustered sibling that has the active database. Though it was unclear at press time how up to date cluster database replicas will be, such an architecture would certainly be less expensive than one providing hot-swap server boxes for every mission-critical Notes server, since a Notes server cluster would require only a few extra boxes to handle the replication load.

On the client side, in this release Lotus is keeping up with the Joneses (Microsoft, that is). With a new calendaring and scheduling application, this Notes release will look similar to Lotus's Organizer package, with its graphical, Day-Timer–like interface. Users will be able to schedule group meetings; this will include using Notes to search for free times for users across the Notes network. Notes calendaring and scheduling will also let users authorize other Notes users to read and update their schedules. Notes users will be able to keep appointment books and maintain to-do lists.

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PERFORMANCE TESTS

Notes Servers

PC MAGAZINE LABS

We tested Notes server OS platforms with 300 client PCs. The results show the impact of multiple CPUs on an application server. Windows NT's built-in SMP support gave it an edge. Solaris wins "most improved" honors over last year.

What the Numbers Mean

In the most significant results, Lotus Notes Server for Windows NT running on two processors ran neck-and neck with the powerful Solaris system. Clearly the second processor affected Windows NT's performance greatly; with just one processor Windows NT ran into some trouble, mostly with the IPX protocol we used.

The NetWare and OS/2 versions held their own as well. The OS/2 package is the most mature of the bunch, while the NetWare version handled our transport protocol most easily.

To get the most out of our testing, we measured both server and client performance. Server-side testing measured how long the server took to perform a given task. Client-side testing measured how long the average client took to complete the client task.

Server task times were entered in the log to record when a task—such as indexing—started and stopped. On the client side, the Notes client program recorded the time it took for a given client to complete a task and then included this time in a message mailed to a central database. The results were organized here in a view to calculate average times for each test.

We periodically ran "show task" and "show status" routines during testing to record the Notes system values. During trials we ran OS system-monitoring tools such as Windows NT's Performance Monitor. We did not use the tools during the actual testing, however.

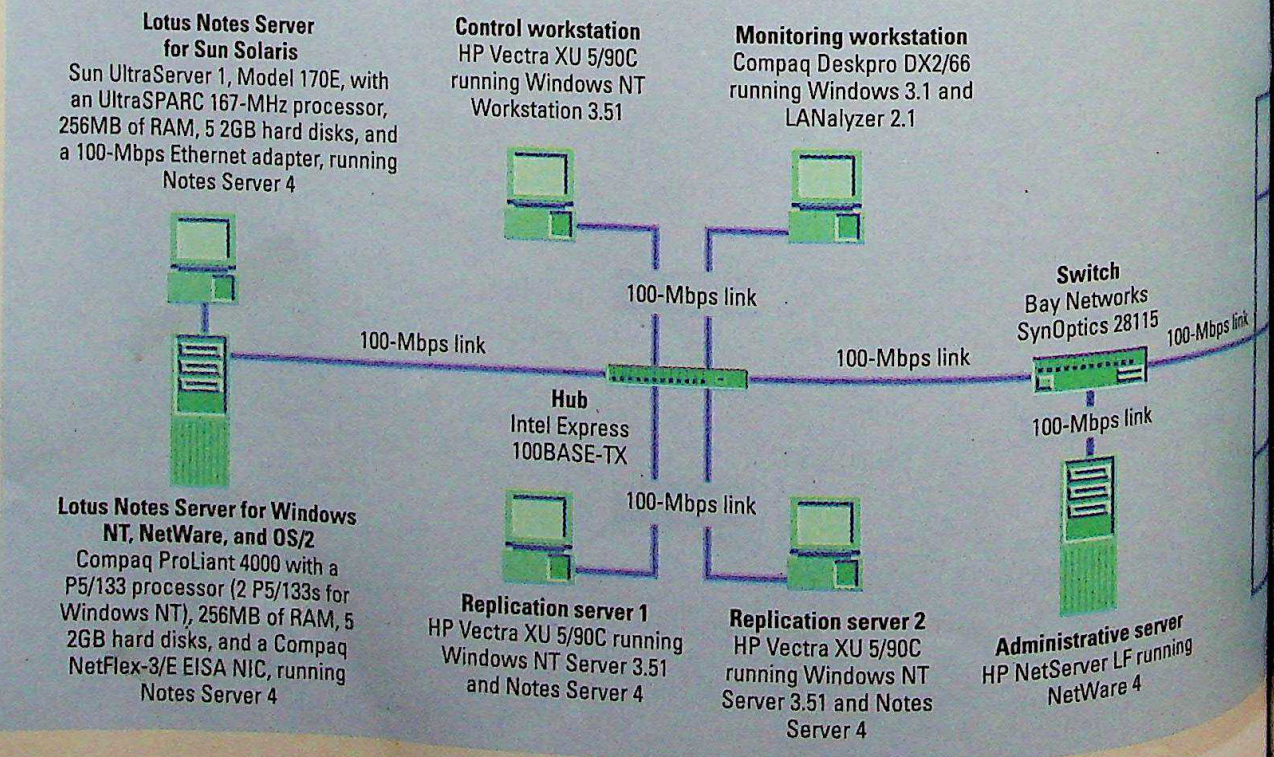
THE REPLICATION TEST

For the server portion of our Replication test, we set up two pairs of replica databases. Each database was 115MB and contained more than 18,000 documents (each document was about 5K). We created, edited, and deleted documents in the four databases to simulate typical modification.

We did not use field-level replication, because we were interested in taxing the server as much as possible. The test Notes server had the two source versions of the replica pair, and two other Notes replication servers held one destination replica each. Because our objective was to test the server's ability to run multiple replication processes, we delegated replication from the server console to each of our replication servers manually.

While our replications were taking place, we ran the client portion of our Replication test. Each client opened one of four Notes databases and ran through a series of such tasks as changing views, reading documents, and creating new documents. At the completion of a task series, we recorded the time for that task iteration and sent the results to the central database.

We ran the server and client portions of our Replication test five times for each platform, adding more clients each time.



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The first wave consisted of 60 users, the second, 120, the third, 180, the fourth, 240, and the fifth and final, 300. We wanted to see how the server task was affected by the additional clients and how the client was affected by the process.

THE INDEX TEST

The Index test was nearly identical to the Replication test, except that on the Index test we reindexed the views of two 120MB databases while performing the client tasks. The client tasks ran at half the speed on the Index test as they did on the Replication test.

Because replication takes less of a processor load than indexing, we were curious to see how the server would handle a higher client load here. Again, we initiated the server indexing directly at the test Notes server console and used the start and stop times recorded by Notes in the LOG.NSF file as our timing results.

THE MAIL TEST

For the Mail test, each client PC had its own mail file and ran a series of read, view-changes, and compose-new-documents tasks. On the server side, we measured delays in mail delivery by monitoring the MAIL.BOX database for undelivered mail.

This test was originally designed to time client and server activity as well. Our mail server configuration held up very well across the platforms, none of which exhibited client latency or server performance issues worth reporting. An inordinately large load on our servers registered little change. One difference we witnessed in Release 4 servers is that they are capable of opening a larger number of databases—at least 300—simultaneously.

For details on all of the tests, including step-by-step task and test database descriptions, check out the Labs Online site at the *PC Magazine* Web home page (*http://www.pcmag.com*).

How We Tested

We set out to test the performance of each server platform in three common configurations. The Replication test used a simulated hub server replicating with other servers. Although most hub servers in production usually don't have users attached, we wanted to see how client loading affected server performance, and vice versa, during replication. The Index test simulates a database server in which clients accessed four databases simultaneously, while the server reindexes the views of two databases. On our Mail test, the server acted as a messaging or mail server with each client PC accessing its own mail database and the server performing mail routing.

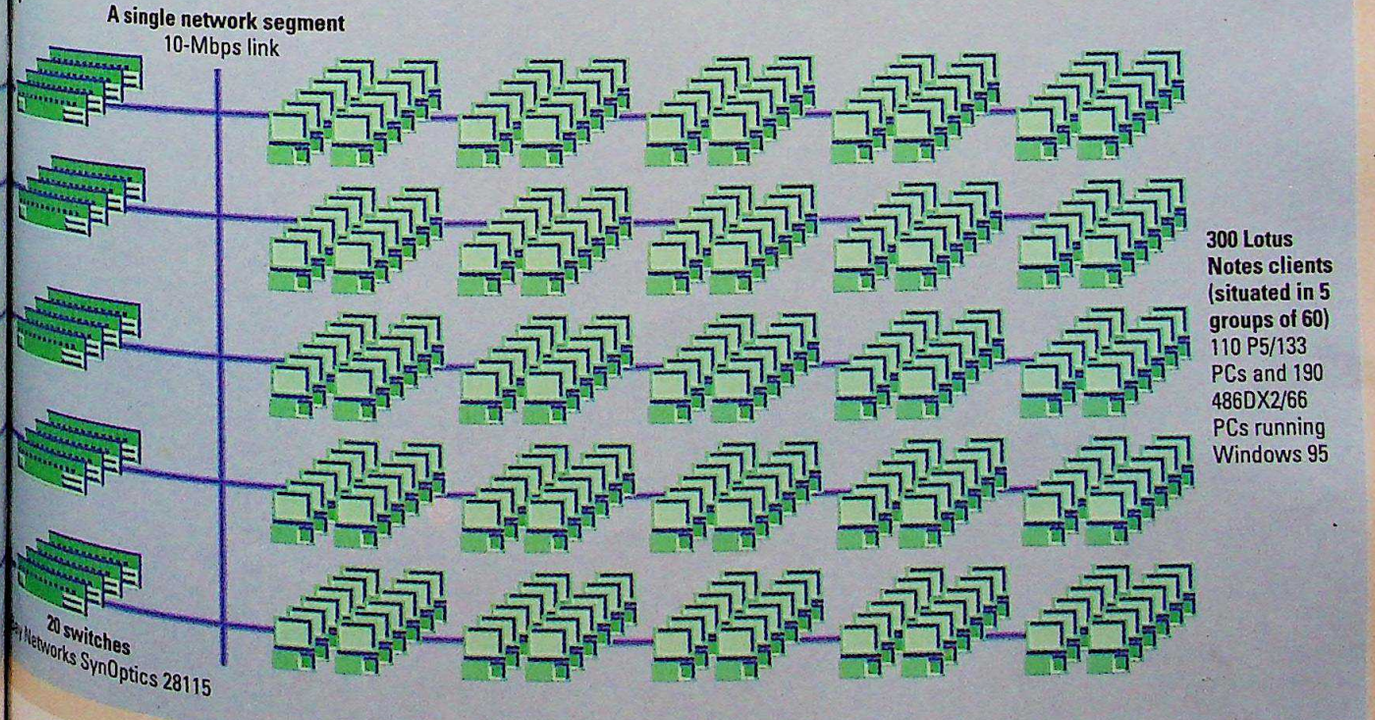
During testing, client systems ran a Visual Basic application we created called PC Magazine Notes Client. Using Windows 95, we simulated user activity by performing a variety of keyboard macros within the Release 4 client. These tasks varied depending upon the test.

The Notes Client program was also used to communicate with the Notes Control system for starting, stopping, and monitoring our tests. Each client ran the Release 4 application and the PC Magazine Notes Client program locally, and each was issued its own Notes ID.

The client PCs were logged on to our administrative NetWare 4.1 server to exchange test status information with the Notes Control application. We observed a light stream of traffic between the two points during setup and test staging and almost no traffic during testing. Aside from storing files, the NetWare server advertised SAPs, which provided clients with the locations of the servers.

We used a range of PC models, from 66-MHz 486DX2s to

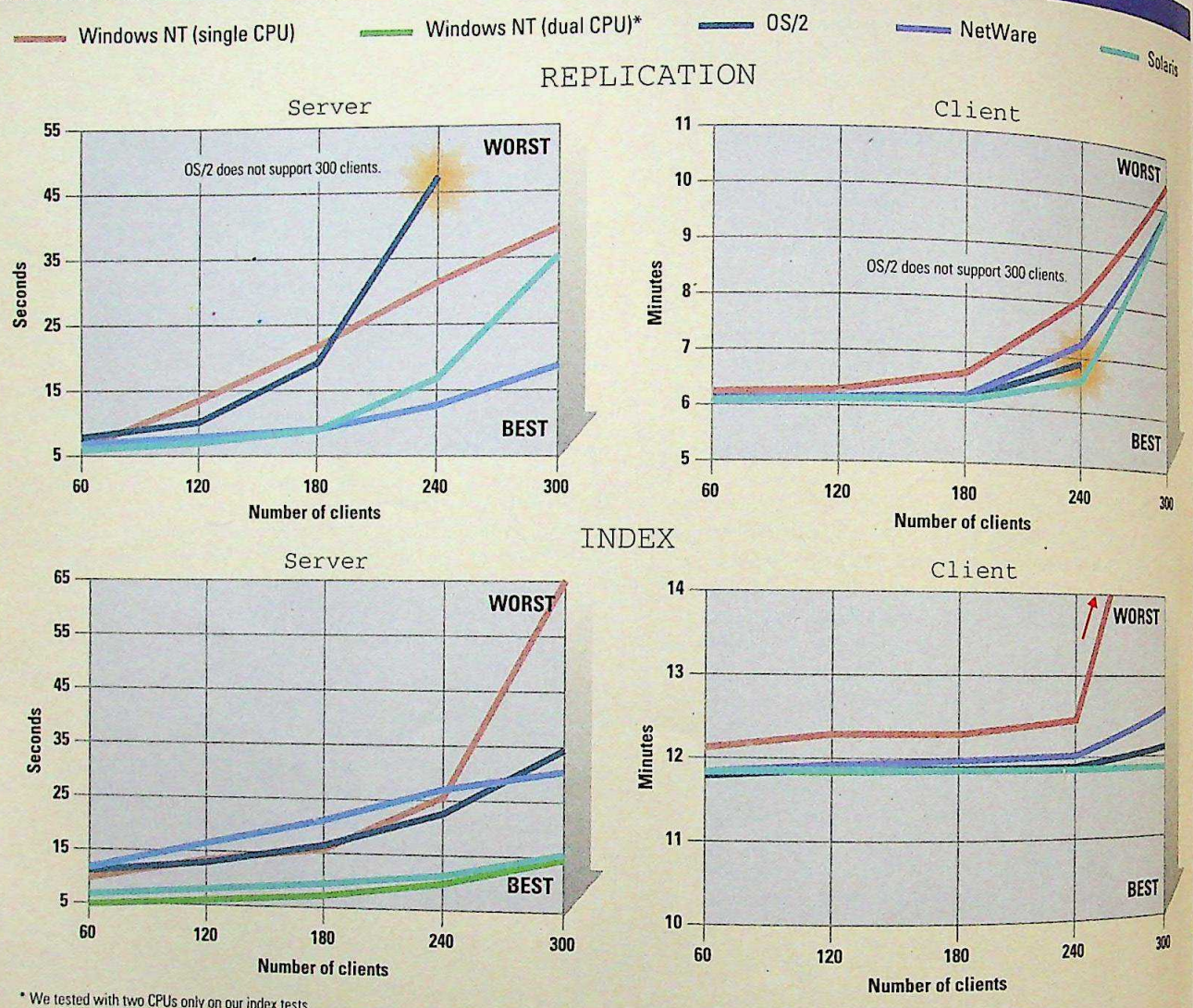
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PERFORMANCE TESTS



* We tested with two CPUs only on our index tests.

Continued

133-MHz Pentiums. Each test group of 60 PCs consisted of an identical mix of systems. The client PCs each connected through a 10-Mbps adapter to its own switched Ethernet port. The switches were Bay Networks SynOptics 28115s.

On the control and monitoring side, *PC Magazine*'s Visual Basic Notes Control application triggered the start and stop of individual tests. It also let us set up tests and provide parameters to the client PCs.

We used a common set of Notes databases, including mail, replication, index, and address book. We used a single ProLiant server with separate external disk arrays for each Intel OS platform tested. To ensure system consistency, we swapped the disk array between tests.

Our server system was identical in network adapter, RAM, and system configuration from test to test. Only the separate disk drives changed for each platform. Each iteration of each test began with fresh versions of all pertinent databases including new LOG.NSF and MAIL.BOX databases. Client PCs began each test with new DESKTOP.DSK.

The replication servers were HP Vectra XU 5/90Cs with 64MB of RAM and a 500MB hard disk. —*Analysis written by Tony Pompili*

OS/2 is installed in 90 percent of the Notes servers in production today, but not necessarily because it was the best product on the market. Until Release 3 of Notes, OS/2 was the only game in town. As a result, Notes sites have invested significantly in training, infrastructure, and add-in products that run on their OS/2 servers. For sites less willing to swap operating systems, Release 4, with more server memory than Release 3, will provide more headroom within the existing system configuration.

We tested Notes on OS/2 Warp Connect with IBM's LAN Server. At press time, IBM's newer network operating system, OS/2 Warp Server, was not certified to run with Notes. According to IBM, Warp Server should provide comparable performance to the LAN Server and Warp Connect combination.

We initially tried to use Warp Connect alone. Warp Connect is the replacement for OS/2 2.1, a client version of OS/2. Warp Server is the NOS version, which has file and print services. But we received an OS/2 SYS0002 error when we tried to run more than 280 users. IBM attributed the limitations to the file-caching capabilities of the Warp Connect FAT and HPFS file systems. Adding LAN Server's HPFS 386

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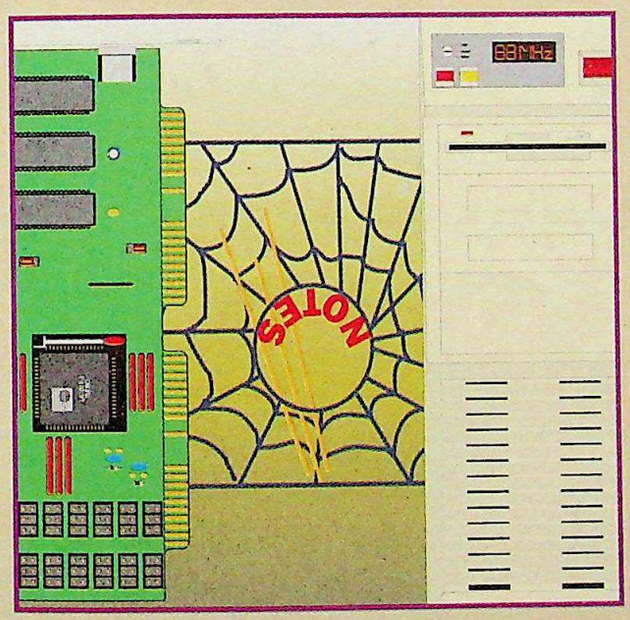
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Notes on the Internet

By Tony Pompili

Back in December of 1995, Lotus introduced to the world a bold plan for making Notes a part of the Internet and the burgeoning world of intranets. Many pieces are in place but just as many have yet to be delivered. When completed, the Notes environment promises to be a rich collection of tools for giving Web browser users access to Notes databases and applications, while also allowing Notes clients to access the world of the Internet.

Lotus's approach to Internet access divides along client and server lines. For the end user, a built-in Web browser was shipped with Release 4 at the beginning of this year. Well, it's not really a browser but a series of Notes macro language and LotusScript functions and commands that let you perform common browser functions, such as connecting to a Web server with a URL. The Release 4 client does ship with a browser application, built from these collections of commands. While not as rich as products such as Netscape Navigator Gold with authoring, JavaScript, and frames support, the browser tools in Notes do support the Internet basics.



Lotus also has included some interesting Web integration features in the Notes client application. For example, any document that contains a properly formatted URL is automatically identified by Notes without your having to create a Notes Doclink or any other link coding. Clicking on the URL launches the Notes browser and connects you to the Internet site. This makes connecting to the Internet virtually invisible to the end user.

The server side to the client is a program called the InterNotes Web Navigator. An optional server task, the Navigator acts as a gateway to the Internet. The nice thing here is that your clients don't have to be running IP; only the server needs IP. So, your clients can talk IPX or NetBIOS to the Notes server and the server talks to the Internet. The Navigator dynamically assigns IP addresses so you don't have to fiddle with that either.

This approach also gives your network folks a rudimentary firewall. Since IP only runs up to the Notes server, you only have to apply Notes certification and server and database access security to protect the network and Notes databases.

OUTSIDE IN

The emerging side of the Notes architecture, though, is the one that gives non-Notes—or Web browser users—access to the Notes databases. To date, Lotus has offered the basic ability to convert Notes databases to HTML pages and collect Web user information in Notes databases. The product is the InterNotes Web Publisher 4.0, available to Notes R4 server sites free from Lotus's Web site at *http://www.lotus.com*. The Web Publisher is also on the Notes R4.1 interim release that shipped last month. The Publisher is a collection of server processes that let you periodically convert selected Notes databases to HTML pages, unlike products such as Folio Views Web Server that perform such conversion on the fly so there's no delay.

Lotus is attempting to move in that direction with its two upcoming releases of Notes. Release 4.11 specifically will include the first Web server that will allow this on-the-fly conversion of Notes documents and views to HTML giving users real-time access.

On the dollar side of things, there's good news. All of the products in the Notes Internet strategy we list here are free, either shipping on new interim release CDs or available for download off of the Internet.

Finally, one optional Lotus product lets Notes servers act as Newsgroup gophers. Called InterNotes News 1.0, this server program lets you convert a Newsgroup database, such as UseNet, into a Notes database. Conversely, your users can take part in discussions by adding documents to the News Notes databases that are periodically converted to Newgroup messages and delivered to the appropriate group.

file system enabled us to finish up most of our tests. We were nevertheless unable to complete our replication tests without getting file-sharing errors on the server. Iris confirmed that Warp Connect running alone is certified for only 250 users.

Like the other platforms we reviewed, Notes Server for OS/2 worked well as a mail server. Even on our CPU-intensive indexing tests it did well against its competition, trailing only Notes Server for Solaris in server processing speed and client performance.

Setup and administration of Notes Server for OS/2 should be a familiar process for most existing sites. As with Windows NT and Solaris, Notes Server for OS/2 is installed directly on the server. Administering and manipulating databases is as easy as using a Notes client running under Presentation Manager. Installing LAN Server was a pretty straightforward task. Because we didn't need file and print sharing, we did the basic setup in order to get the HPFS 386. We also downloaded the HPFS386 .IFS patch.

Warp Connect simplifies network setup, allowing you to install the NetWare Requestor for OS/2 during setup. It's still not quite as smooth as Windows NT, but it does make getting your Notes server up a

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Notes Add-Ins Fill Out Your Server

By Tony Pompili

No man is an island, and neither is your Notes system. Adopters of Lotus Notes Release 3 found that to keep up with their users' needs, they had to install a variety of Notes add-in processes. These included mail and fax gateways, specialized products for supporting LN:DI (pronounced *lindy*), and systems for sending pages. Not all of these processes are yet available for Release 4, though they are on the horizon. Depending on your server platform, however, some of the processes may never be available. The table here shows Lotus add-in products for Notes 4 and their availability status.

For example, the MHS gateway, once the message-exchange gateway of choice, has been unseated by the SMTP MTA. If you're running MHS, you may find this a good time to consider a change or expect to maintain your Release 3 server. Other products, such as the SNA Driver 4.1 will be available only on OS/2 and Windows NT servers. Administrators choosing NetWare and Unix may find it necessary to set up another platform to provide for host connectivity.

Whatever your platform, some processes will always require a separate platform. LN:DI and the Lotus Fax Server for Notes both run only on Windows 3.1 PCs. These aren't servers but networked PCs with the Notes client.

ADD-INS		PLATFORM SUPPORT FOR RELEASE 4 ADD-INS					
For Release 3	For Release 4	NetWare	OS/2	Windows 3.1	Windows 95	Windows NT	Unix
cc:Mail Exchange	cc:Mail MTA	3Q 1996	3Q 1996	3Q 1996	3Q 1996	3Q 1996	3Q 1996
LN:DI IPS 2.6*	Not planned	N/A	N/A	N/A	N/A	N/A	N/A
LN:DI MSS 2.6*	Not planned	N/A	N/A	N/A	N/A	N/A	N/A
Lotus Fax Server 1.1*	Lotus Fax Server 1.1*	Not planned	Not planned	Shipping	Not planned	Shipping	Not planned
Lotus Notes Pager Gateway 1.1	Lotus Notes Pager Gateway 2.0	Not planned	3Q 1996	Not planned	Not planned	3Q 1996	Not planned
MHS Gateway	Not planned	N/A	N/A	N/A	N/A	N/A	N/A
Phone Notes 2.0	Not planned	N/A	N/A	N/A	N/A	N/A	N/A
SMTP Gateway	SMTP MTA	3Q 1996	3Q 1996	3Q 1996	3Q 1996	3Q 1996	3Q 1996
SNA Driver	SNA Driver	Not planned	3Q 1996	Not planned	Not planned	3Q 1996	Not planned
Web Publisher 2.0	Web Publisher 4.0	Shipping	Shipping	Shipping	Shipping	Shipping	Shipping

N/A—Not applicable: No Release 4 version of this add-in is planned.
* The product is an independent server application and does not rely on a Release 4 server.

little easier than it was with earlier versions of OS/2.

Release 4 of Notes will give a big boost to existing OS/2 servers. It certainly adds value to your current investment in people and servers. Expect, however, to hit capacity ceilings for single-processor servers sooner than with the other platforms. The SMP version, though, will provide room for growth down the road.

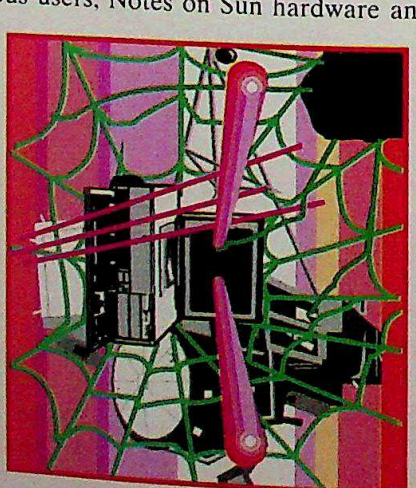
Lotus Development Corp.

Lotus Notes Server for Solaris

If you're looking to consolidate Notes servers in a big way right now and you have the budget, the Unix-based Lotus Notes Server for Solaris could well be your solution. Notes on Solaris has come a long way since last year's resource hog. Though available with only single-processor hardware at the time we tested, Notes Server for Solaris posted overall performance test results barely second to those of the dual-processor Notes Server for NT.

Granted, Sun's new Ultra line, with its 167-MHz RISC processor, naturally outperforms the *x*86-based ProLiant 4000 that the other three OSs ran on. But beyond that, Sun's rewritten code with true thread architecture (versus Release 3's spawning process) makes it a box with a lot of potential.

It is Unix, though, so it is more expensive, requires Unix-savvy Notes administrators (or Notes-savvy Unix administrators, depending on your approach), and brings with it some minor database-incompatibility issues. But for companies looking at setting up a super-server with the potential to support 2,000 simultaneous users, Notes on Sun hardware and software is well worth considering.



We used Solaris and Sun workstations for our Unix testing because of their popularity and the tight development relationship between Sun and Lotus. Lotus has developed other Unix single-processor and SMP flavors, including one for AIX (from its parent company, IBM) and one for Hewlett-Packard's UX. Unlike the OS/2, Windows NT, and NetWare versions of Notes developed completely by Iris, Lotus works directly with Unix vendors to code the Unix line.

During testing, Notes Server for Solaris produced the best single-processor results and it ran neck and neck with dual-processor Notes Server for NT. It's too bad the SMP version was not available during our extended testing period. The Ultra 1 model 170 system we tested, however, had processing head room to spare. We tested the Notes server on Solaris 2.5.

By the time you read this, the multiprocessor version of the Ultra—the Ultra 2—will be available. In addition, the new version of Solaris (Version 2.51) necessary to support the multiple processors will be on the market. Sun offers a variety of configurations of the Ultra line, with one box —the Ultra 6000 Enterprise server—sup-

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porting as many as 20 processors.

Assuming your Solaris OS is already up and running, setting up Notes on Solaris is not much different from setting it up on other platforms. We installed a variety of patches and fixes mentioned in the Notes release files, as well as a few others recommended by Sun. This Unix stuff isn't for the OS novice.

Because we were running SPX, we installed Sun's PC Protocol Services, Version 1.1. One of the advantages of Sun's IPX/SPX implementation is that PC Protocol Services does not require a NetWare server to enable clients to locate the server. No other product in our roundup had this feature. We did, however, encounter one problem: Sun's IPX/SPX does not support packets of 1,500 bytes or more. We bypassed this hurdle by running our tests using 1,400 bytes, which affected performance only marginally.

Our testing revealed a few quirks particular to the Notes Server for Solaris. We used TCP/IP and FTP to copy our test databases between a Windows NT server and a Solaris server. We found that once copied to the Solaris system, our database View index had to be rebuilt.

According to Lotus, this occurs because database indexes are written to a specific bit order of the operating system. Although performing OS-level copies among Intel boxes (OS/2 to Windows NT, for example) doesn't confuse Notes, moving databases between Unix and other platforms can cause some problems. Of course, rebuilding the index, using Updall or Ctrl-Shift-F9 from the client, fixes the problem.

> If you can get over the sticker shock, Lotus Notes Server for Solaris is a powerful super-server.

Another hitch occurred during our indexing and replication tests. Documents remained in the server's routing database, called MAIL.BOX, for the duration of the test. These messages caused the Notes server to react as if the MAIL.BOX was corrupted, setting off a series of consistency checks that sometimes prevented delivery of messages. Lotus said the problem will be fixed by the next maintenance release.

Notes Server for Solaris is a powerful package with hardware that far exceeds the growth potential of any Intel solution. This comes at a price. Apart from any training investment you might need, the Sun boxes themselves do not come cheap. The system we tested costs $51,740; our dual-processor Intel system costs around $25,000. But for companies willing to pay for headroom and scalability options galore, Notes and Solaris are an amazing combination. □



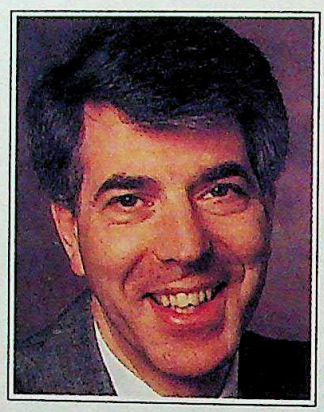
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Will the Internet Crash?

A spike in traffic on a busy Internet service provider's system causes a hitherto-undetected bug to surface in a router that hands off packets to one of the system's backbones. The bug crashes the router. Millions of data packets bounce off the router, and given the self-healing properties of the Internet's design, another router attempts to pick up the traffic. Unfortunately, it's the same make and model as the one that failed under load, and it dies the same horrible death.

In a nightmare scenario worthy of a Tom Clancy novel, the dominoes continue to fall until the magnificent, well-oiled machine that was the Internet is reduced to a quivering mass of local nodes carrying sporadic traffic, while a virtual silence echoes across the once-mighty backbones. Millions of users pound their fists in frustration and shout imprecations at their screens. Such calamities are not unknown. A bad circuit breaker (or, say some extremists, a UFO) caused a chain reaction that blacked out most of the Northeast back in the mid-1960s.



IN THE INFO-DARK

Calamities are not unknown, but it's unlikely the Net will suffer a catastrophic collapse.

Could it happen? Sure. It's what pessimists live for. Will it happen? Not likely. I'd be the last person to tell you that any system is foolproof or that all of the bugs have been caught, but telecommunications systems are well monitored and continually spew out exhaustive statistics and logs. ISPs ignore them at their own peril, as do Web administrators. The companies that carry the Net's all-important backbone traffic are long-distance telephone companies, and they know a thing or two about queuing, statistics, and unruly clients.

Back in 1984, long before ZD Net, there was PC MagNet, a service begun so our readers could download the utilities we published in the magazine. PC MagNet started as a PC XT running two modems, but reader demand kept it growing until we were running 48 lines in New York and 36 lines in San Francisco. We weren't on a network—access was free, but you paid the long-distance charges.

One day, I got a call from the folks at AT&T's long-distance operations center. They wanted to know if I was in charge of PC MagNet. I said yes, whereupon they said that we had to shut it down, and if we didn't, they would. I wouldn't call our exchange the height of customer-friendly conversations, but the bottom line was that we were causing major problems on the long-distance network. It seems that each time our magazine arrived at their homes, tens of thousands of readers all called (or tried to call) one of our two numbers. The resulting busy signals caused statistical aberrations unlike any the long-distance folks had ever seen. In fact, the call peaks were so well orchestrated, AT&T thought we were pulling some kind of prank or purposely trying to crash an area code or two. (How's that for paranoia?)

We moved quickly to CompuServe to get off the public switched network. We're still there, but the real action today is at our Web sites, *http://www.pcmag.com* and *http://www.zdnet.com*.

The point is simple: If high volume were to threaten the integrity of the network, the people in charge of keeping it running would think nothing of pulling a high-volume, nonessential site or two offline to keep the data flowing in more essential areas, such as e-mail. My guess is that a bunch of leering guys could go without their megapixel downloads from *playboy.com* if it meant the difference between a functioning Web and the doomsday scenario.

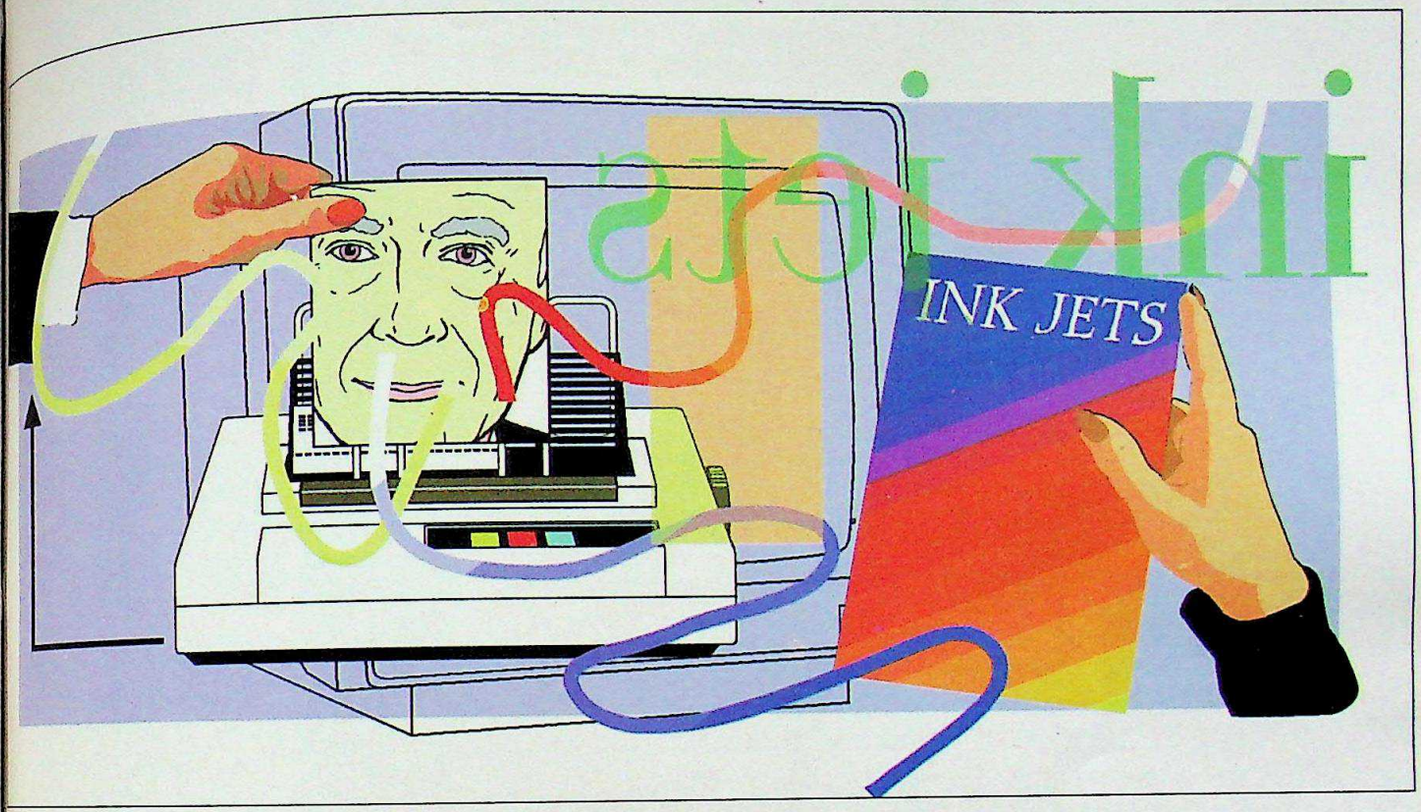
Despite the frequent characterizations of the Internet as a place where no one is in charge, real people in real companies are the service providers, run the network access points (NAPs), and supervise the metropolitan area exchanges (MAEs). They may not have any idea of how many packets per second are going to beleaguer their routers and fiber connections, but these supervisors know exactly what they'll do if a router fails or if a hunk of fiber drops off-line.

These people aren't working for free. They get a piece of your connect charges, and you can bet that they're making money on the deal. Some pundits worry about the effect of massive streaming audio and video on the Internet. It hasn't arrived yet, but when it does, we'll pay every step of the way for the necessary increases in bandwidth and router performance. The long-distance companies have unused bandwidth in the form of dark fibers that are just waiting for the right application to bring them online.

In the meantime, problems? Sure. Slowdowns? Yes. A catastrophic crash that leaves us in the info-dark? No way. □

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An Ink Jet In Every Pot

By Bruce Brown

For most home PC users in the market for a printer, the question is no longer what *kind* of printer to buy, but rather *which* color ink jet printer to choose. Even though several tempting laser printers now cost less than $500, the kids want color, and color in home applications for all ages tilts the balance in favor of ink jets.

The reasons are clear: Home ink jet printers are inexpensive, easy to use, and fairly cheap to operate for low-volume printing. With street prices starting at just under $200, you can buy a color-equipped ink jet printer that will print text, black-and-white graphics, kids' artwork created with drawing and paint software, and even color photos.

To find ink jets for this roundup, we looked to the four biggest ink jet sellers in the U.S.: Hewlett-Packard Co. (with 59 percent of the home market), Canon Computer Systems (21 percent), Epson America (10 percent), and Lexmark International (3 percent).

IN THIS REVIEW

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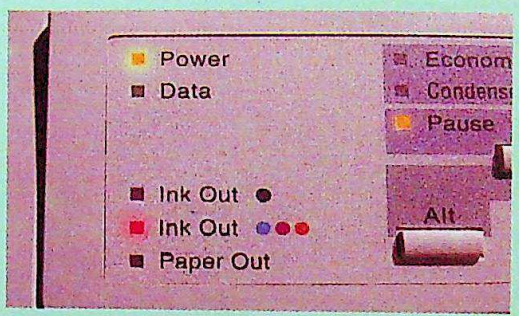
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The Fine Print



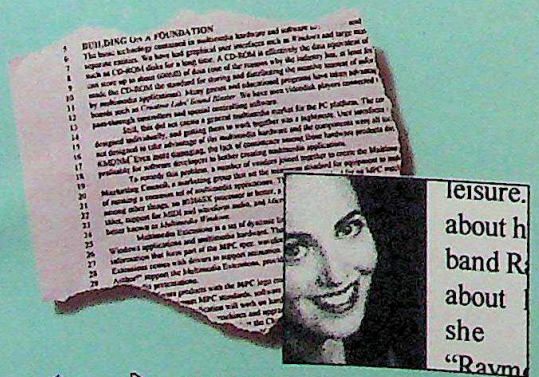
SAY IT BIG *The HP DeskJet 682C is the first ink jet printer able to print on fanfold paper. Now you can make that "I Love You" banner in color and up to 20 feet long if you like. Impress your boss with a really big spreadsheet.*





DON'T RUN DRY *Canon's BJC-610 and Epson's Stylus Color II and Stylus Color IIs help you avoid running out of ink. An indicator light on the printer blinks while there's still a little ink left. The Lexmark printers have a software alert.*

BETTER AND CHEAPER *Print quality from home ink jets has been steadily improving, and prices have continued to decline. This story's Editors' Choice four-color model costs just $330. The cost per printed page, though, hasn't declined much.*



PLAIN VS. COATED *On regular copier paper, most home ink jets still show tell-tale fuzziness. For cleaner output, you'll need coated paper (inset).*



RAINY-DAY FUN *Several printers come complete with software for various rainy-day activities. From Disney calendars to T-shirt transfers to Crayola coloring books, these extras will keep the kids busy.*

REVIEW CRITERIA

We wanted only printers [that] are sold to the home market [for] use with PCs and that incl[ude] color as a standard feature. [We] also limited our field to pri[nters] that typically sell for no m[ore] than $500 on the street (th[ough] a manufacturer's list p[rice] might be higher).

The four vendors sub[mitted] ten printers for review. T[hese] printers each came from C[anon] (the BJC-210, BJC-410[0], a[nd] BJC-610) and Hewlett-Pack[ard] (the HP DeskJet 600C, 6[40C] and 820Cse). Epson's St[ylus] Color II and Stylus Color [IIs] and Lexmark's Color Jetpr[inter] 1020 and 2070 round out [the] field.

RESOLUTION AND COLOR QUALI[TY]

All the printers let you cho[ose] from among different reso[lu]tion modes. *Resolution* [is] measure of output qual[ity] usually specified in *dots [per] inch* (dpi). The more dot[s] printer packs into a squ[are] inch, the better the output [will] look. The standard resolu[tion] modes (typically 300 dpi [or] 360 dpi) produce text [and] graphics output that is go[od] enough for most tasks, wh[ile] the slower (and more ink-hu[n]gry) high-quality modes (fr[om] 600 dpi to 720 dpi, depend[ing] on the printer) should be [re]served for when quality re[ally] counts.

To produce color doc[u]ments, ink jets combine th[ree] ink colors: cyan (art speak [for] light blue), magenta, and [yel]low. The more expensive p[rin]ters use a four-color syst[em] adding a dedicated cartrid[ge] for black ink that stays loa[ded] all the time. This saves you [the] hassle of manually popp[ing] out the color-ink cartridge [and] dropping in a black-ink [one] when you want to print [in] black and white.

If you opt for one of the le[ss]

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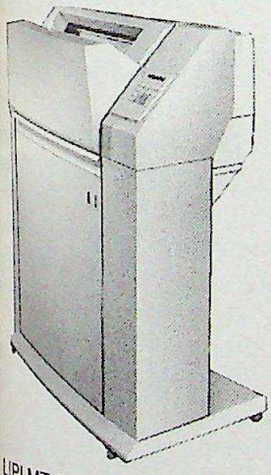
A taxing decathlon is a simple cake-walk for a champion



Like the Lipi

MT Line Matrix Computer Printer

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expensive three-color units, you must not only continually swap cartridges, but you'll have to put up with inferior print quality for your trouble. Black text on a color page is created by mixing the cyan, magenta, and yellow inks for what is known as *composite black*. It can look muddy, with color halos sometimes visible. We recommend paying the $50 to $75 price premium to step up to a true four-color printer.

While none of the monochrome output is quite laser-quality—the ink tends to wick into the paper and spread—the black text produced by the three HP DeskJet entries was exceptional. All ten printers mustered color output that was more than adequate for jazzing up school reports and brightening rainy days with art projects, and there were several standouts, including the Epson Stylus Color II and the HP DeskJet 682C and 820Cse.

Do note that with ink jet printers, investing in high-quality paper almost always yields better results. Ink jets produce adequate text quality on plain copier paper, which costs a penny a sheet, but graphics are usually good enough only for draft copies. A slight step up to the smoother paper rated for laser printers (about 10 cents a sheet) returns a markedly better product. With coated stock made specifically for ink jets (10 to 15 cents a sheet), the colors get even richer, the blacks even blacker, and the details sharper. For the highest-quality needs, such as photo output, $1-per-sheet glossy paper can produce stunning results.

A PLEASURE TO USE

Once installed and configured, these printers were, as a group, a pleasure to use. You can print using the default settings, so you may need a printer's control software only to select special paper. Each printer's software can automatically select and print the correct colors as your work calls for them. If you want to manually select settings, the software offers a tabbed-page interface with colorful and generally easy-to-follow option selection screens.

Beyond these basics, printer vendors have started including free software targeted at home users. For instance, Canon delivers its Canon Creative for Windows package, which includes kids art software from Crayola and a Hallmark greeting card maker. Epson delivers Sierra On-Line's Print Artist 3.0 with its units, while HP gives buyers of the DeskJet 682C its Home Project Kit, which includes the excellent PrintPaks Family Fun Kit and Disney's Mickey and Friends Print Studio CD-ROM. HP bundles Microsoft Publisher for Windows 95 with its home office–oriented DeskJet 820Cse.

An important point to keep in mind before you buy is reliability of a printer and a vendor's service policy. We surveyed subscribers at random, asking them to rate manufacturers they had used in four key areas: satisfaction with their printers in overall reliability, repair experience, technical support, and number of repairs needed in the first 12 months of use. Canon, Epson, and HP all received A grades, indicating that their ratings in each category were above average. Lexmark received a B, rated above average in every category but five-year repairs, where it earned a creditable average rating.

THE FINAL DECISION

To help you sort out each product's strengths and shortcomings, we've filled out a report card for each printer, grading on output quality, ease of use, speed, cost of operation, and warranty and support. But you will win with any of these printers. With their overall high-quality output, ease of use, good paper handling, and reasonable purchase price, you might find it hard to choose among the ten ink jets, but in no case will you find a loser.

HP DeskJet 682C

Among the color ink jet printers in this review, the six four-color units deliver fine overall output quality, while the four three-color printers will suffice for users on a stricter budget.

The best of the best is the just-released HP DeskJet 682C. For about $330 on the street, you get a four-color design that delivers some of the best black-and-white output and consistently above-average color, even on plain paper. Its color photos on glossy paper were among the best we saw, and cost per page for color pages was lower than the average for the group. What clinches our Editors' Choice is the 682C's ability to print on fanfold paper, allowing you to create colorful banners—the first and only ink jet to offer this capability. With the included PrintPaks and Disney art project software, you have a winning home bundle. Some dealers will sell the same printer, minus the software, as the DeskJet 680C for around $310.

PC MAGAZINE EDITORS' CHOICE

Two products merit honorable mention. Users with a SOHO bent should consider the HP DeskJet 820Cse ($390), which delivers the best text output of the group and arguably the best color output. It's also among the fastest printers we tested. For the very best photographic output, the Epson Stylus Color II ($450) delivers unsurpassed 720-dpi graphics mode, though you'll need to use the company's special 720-dpi paper.

The Canon BJC-610 ($470) and Lexmark Color Jetprinter 2070 ($49[illegible]) also produced some superb color output during our runs.

Given how inexpensive four-color ink jets have become, we don't recommend a three-color model. Still, there's nothing wrong with the quality of the Canon BJC-210 ($240), Epson Stylus Color IIs ($29[illegible]), HP DeskJet 600C ($250), and Lexmark Color Jetprinter 1020 ($200).

Our Contributors BRUCE BROWN is a contributing editor and DAVID R. LAMBERT is an assistant copy editor of *PC Magazine*. JAMIE M. BSALES was the associate editor in charge of this story, and DENIS TOM was the project leader.

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Canon Computer Systems Inc.

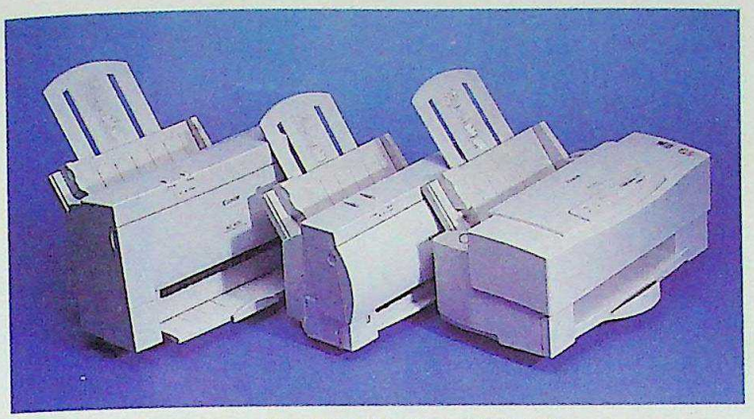
Canon BJC-210

ALL REVIEWS BY BRUCE BROWN

If funds are tight and you must settle for a low-cost three-color ink jet printer, the Canon BJC-210 is a fine choice. It lists at $259, with an estimated street price of $240. This unit gets a leg up on the other units we reviewed partly because of Canon's unique user-aware packaging and documentation but also because of the company's class-leading service and support policies. With acceptable (but not great) quality and speed, plus Canon's excellent family-oriented software, this printer is a good bet.

The smallest of all printers reviewed here, the Canon BJC-210 has a maximum graphics resolution of 720 by 360 and a 100-sheet paper tray.

Users will find Canon's 800 support number throughout the enclosed documentation. A complete manual is included, but all you really need to get up and running is the fold-out quick-start guide. Once you've installed the printer software, a full-color online manual is ready to explain and guide you through just about any printer problem or project you may face. Canon's aggressive commitment to user support will be reassuring to the most novice buyers.



Canon's ink jet trio: the BJC-4100, BJC-210, and BJC-610.

Canon Creative for Windows, a collection of graphics software with a cartoonlike main menu screen, comes with all of Canon's home printers. The collection's components include Hallmark Connections software (from Micrographx) for making greeting cards, Crayola Art coloring books, and modules for creating cross-stitch patterns, stickers and labels, and personalized stationery. Canon sells a variety of special papers for its ink jet printers, including transfer paper that you can use to create custom T-shirts designed with your own graphics, drawings, or scanned-in photos.

REPORT CARD	
Canon BJC-210	
Output quality	B
Ease of use	A
Speed	B
Cost of operation	B
Warranty and support	A

The BJC-210's overall print quality was its weakest factor. Print-outs showed slightly fuzzy text, a little banding in monochrome graphics printing, less-dense color than most of the other printers produced, and visible dots; photo reproduction was relatively grainy-looking. It's easy to be picky when other printers do a much better job, but this printer is fine for draft work and certainly acceptable for purely home use.

Black-ink cartridges cost $25 and color cartridges cost $35. Canon conservatively rates the BJC-210 at 5 cents per page with 5 percent black coverage and at about 18 cents with 15 percent color coverage. But our drain testing found costs to be closer to 2 cents per page for black (the lowest page cost in this group) and a dime for color pages.

Most attractive is Canon's combination of a two-year warranty with toll-free technical support. If the printer fails at any time during the warranty period, Canon will replace it for free and pay for round-trip shipping, a reassuring benefit that is matched by Lexmark but costs extra with Hewlett-Packard and is not available from Epson.

A four-color printer offers added convenience and higher output quality, but the Canon BJC-210 is a solid choice for a family on a budget.

HOME PRINTERS

How to Read the Report Cards

For home users, the most important factor in choosing an ink jet printer (after perhaps price) is output quality. But typical customers also report a number of other concerns. Ease of use is important, as are the cost of operation and the manufacturer's warranty policy. In our report cards, we rate each printer on the five most important decision points and assign it a grade—from A, which indicates excellent, *to E for* unacceptable *—based on the factors described here.*

To gauge **output quality,** we had a panel of *PC Magazine* staffers examine various samples from each printer. The panelists worked individually and were not told which printer had produced each sample. They viewed monochrome text output, gray-scale output (graphics and a black-and-white photo), color graphics (a child's drawing and a business pie chart), and color photos. All of these were printed on plain copier paper and ink jet paper; the color photo was also printed on glossy stock.

To arrive at a grade for **ease of use,** we considered factors such as the printer's setup routine and paper-handling capabilities. A an A indicates clear, well-illustrated documentation and straightforward software installation. We also evaluated how user-friendly the included printing utilities were and the ease of replacing empty ink cartridges.

The **speed** grade reflects how well the printer performed on our three speed tests, which involved printing a plain text document, a newsletter page, and a complex page containing text and colored bar charts.

Cost of operation reflects the unit's probable running costs in comparison with its peers. A high grade indicates long-life ink cartridges and a relatively low cost per page, both for black-and-white and color output.

The **warranty and support** grade reflects a vendor's support policies. An A indicates a generous, no-cost warranty as well as a liberal exchange policy should a unit need service.

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Canon Computer Systems Inc.

Canon BJC-4100

Canon's midrange home printer, the BJC-4100, can also perform acceptably for small-office or home office use. The unit has the same top-ranked packaging, software, and service and support as the Canon BJC-210, but the four-color BJC-4100 has consistently better output than the other Canons. The BJC-4100, with a $349 list price and a $330 street price, will cost you about $90 more than the BJC-210, but it's worth the increase.

REPORT CARD

Canon BJC-4100

Output quality	B
Ease of use	A
Speed	B
Cost of operation	B
Warranty and support	A

Midsized at 11.5 by 16 by 19.5 inches (HWD), the BJC-4100 has the same 720-by-360 maximum graphics resolution and 100-sheet paper capacity as the BJC-210. Canon also packs the versatile Canon Creative for Windows software with this printer. Setup and configuration are a breeze with the BJC-4100's documentation and user aids, including its foolproof software.

Output samples showed the BJC-4100 to be a clear step up from the BJC-210, but still average compared with the full field of printers we reviewed. Black text had only minor fuzziness, but monochrome and color photograph reproduction each showed minor banding. In all cases, print quality improved significantly with better-grade paper, so if you buy this printer we recommend spending the extra money for premium-grade plain paper.

You can outfit the BJC-4100 with different types of ink cartridges. An optional $29 high-capacity all-black cartridge is rated at a competitive 3 cents per 5-percent-black page. The standard two-part cartridge holds a $7.40 black replacement tank and a $21 color replacement. Color is rated at 13.5 cents per 15 percent page, and our drain tests peg the cost at around 12 cents—on a par with the rest of the field.

The Canon BJC-4100 is a good all-round printer. To Boot, you get Canon's generous customer service and warranty programs. But it's got some tough competitors, especially the HP DeskJet 682C, which delivers better overall print quality and the ability to handle fanfold paper for the same street price.

Canon Computer Systems Inc.

Canon BJC-610

Canon's highest-quality home printer, the $499 BJC-610 ($470 street), is slower than the less-expensive BJC-210 and BJC-4100; but its color and graphics printing quality is worth the wait. Add to that a low cost per printed page and Canon's superior setup and reference aids, and the BJC-610 is a contender.

REPORT CARD

Canon BJC-610

Output quality	B
Ease of use	A
Speed	C
Cost of operation	A
Warranty and support	A

With 192 color printing jets, the BJC-610 can print graphics at a resolution of up to 720 by 720 dpi. Color graphics samples had reasonably dense and true colors on coated ink jet stock, but photograph samples were only average, exhibiting minor banding and slightly fuzzy images even on expensive stock. Text printing on standard copier paper was quite good, and monochrome graphics showed very little banding.

The BJC-610 uses separate cartridges for the four ink colors (cyan, magenta, yellow, and black); other four-color printers have separate black cartridges but combine other colors into single cartridges. Replacement black-ink tanks cost $12.25 each, and the smaller tanks are $8 apiece. Canon rates the printer at 2.5 cents per 5-percent-black page and 7 cents for each 15-percent-color page, figures closely matched by our drain test results of 3 cents for black and 7 cents for color.

Canon includes the versatile Canon Creative for Windows software package with the BJC-610. Also welcome is a standard two-year warranty and free overnight exchange of defective units.

The Canon BJC-610's top warranty, easy setup procedure, and low printing costs are its best features compared with competing printers like the Epson Stylus Color II and HP DeskJet 820Cse. These Epson and HP printers both have faster print speeds and equal or better print quality, but the BJC-610 is still worth a closer look.

Epson America Inc.

Stylus Color II

Of the ten printers viewed here, Epson's $649 Stylus Color II ($450 street price) does the best job of reproducing color photographs on midpriced paper. This four-color ink jet printer works with plain paper, but you'll be most impressed with the results if you print on Epson's own 720-dpi paper ($14.49 for 100 sheets). The strong suit has a dark side, however: Printing on plain paper or on any ink jet stock not specifically Epson-branded produces average quality at best.

REPORT CARD

Epson Stylus Color II

Output quality	A
Ease of use	A
Speed	B
Cost of operation	B
Warranty and support	B

Compatible with the Macintosh as well, the Stylus Color II is the only choice among the tested printers for home use. It holds with both a PC and a Mac, has a maximum graphics resolution of 720 by 720 dpi, though you must use Epson paper rated for this resolution. No software comes with the printer, but a coupon is included for free copies of Storm's E-Z Photo 1.1 (for photo scanning and image editing) and Sierra On-Line's Print Artist 3.0.

You'll find separate documentation for installing the printer for use with Windows 95 and Macintosh systems. In addition to a complete manual, there are also instructional

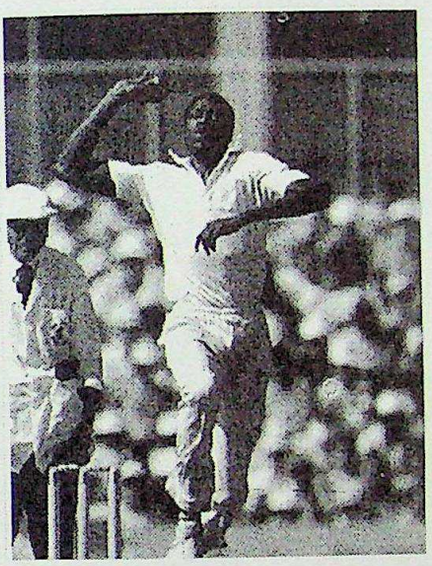


Epson's three-color Stylus Color IIs and four-color Stylus Color II.

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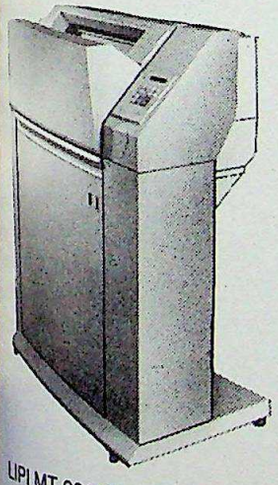
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IMPULSE/174/96/o3

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and labels on the printer itself.

The ample user aids help you with setup, and the tabbed-page printer driver applet simplifies configuration for print jobs. Epson's two-year warranty is backed by toll-free tech support.

Text printing on plain paper is only average, with noticeable ink jet fuzziness. Black-and-white samples of a newsletter printed with default settings on coated stock produced somewhat light and grainy photo images but strikingly sharp text. Color graphics print-outs had slight banding but consistently deep colors. Color photos printed on plain paper and on glossy stock were only average, but the output on Epson's 720-dpi paper was exceptional.

Rated at 4 cents per 5-percent-black page and 12 cents per 15-percent-color page, the Stylus Color II came in slightly above that on our drain tests (5 cents and 15 cents), making it slightly more expensive to run than most other ink-jet. Black-ink cartridges cost $25, and color cartridges cost $38.

Family members will enjoy photography or printing photo files will appreciate the Epson Stylus Color II for quality output at a reasonable cost. It's also sturdy.

Assessing the Output

CANON BJC-210 *Text shows tell-tale ink jet fuzziness on plain paper. The clown is printed on medium-grade stock, because BJC-210 images didn't take well to glossy paper.*

CANON BJC-4100 *The pie chart (on ink jet paper) shows only minor banding. Like the BJC-210, this Canon unit produced better photo output on medium rather than high-grade paper.*

CANON BJC-610 *The text on copier paper is good, but the image shows banding—as does the clown. Pie chart colors were fairly consistent and reasonably dense on coated stock.*

EPSON STYLUS COLOR II *Plain-paper text and graphics show jaggies and weak resolution, but the color chart is excellent. The photo, printed on Epson's special 720-dpi stock, is superb.*

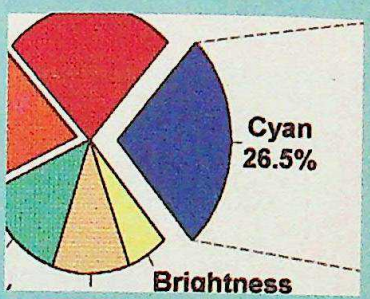
EPSON STYLUS COLOR IIS *Gray-scale print samples were decent, with only slight fuzz. The graphic is consistent with good color depth for a three-color printer. The clown is on Epson's special paper.*

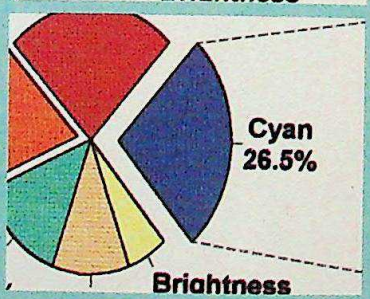


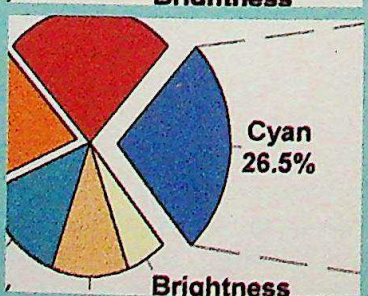


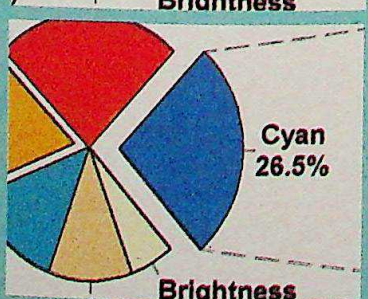


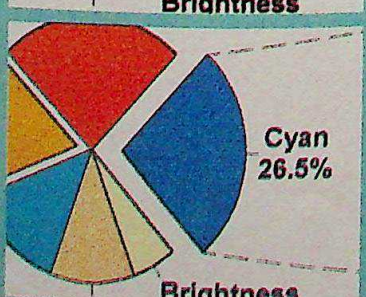
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...r home-office duty or for ...king low-cost proofs in a ...phics art environment. If ...u use only Epson's premi... papers, you'll never ...plain about print quali... though the printer's mid... ...e quality on plain paper ...k makes its relatively ...h purchase price harder ...ccept.

Epson America Inc.

Epson Stylus Color IIs

Though the names are close, the $349 Epson Stylus Color IIs ($230 street) is not in the same league as its more expensive sibling, the Stylus Color II. It produces reasonable output for a printer in this price range and is a good choice for the budget-conscious buyer.

The Stylus Color IIs is a three-color printer and you must switch between black and color cartridges for monochrome and color jobs, and blacks on color pages will have a somewhat muddy appearance. Slower than its four-color sibling, it has a maximum resolution of 360 dpi, but because it uses smaller-than-usual dots on a 720- by 720-dot grid, this low-end printer can print fine images.

The IIs performs best on Epson's special stock. Surprisingly, on our print samples it outperformed the more ex-

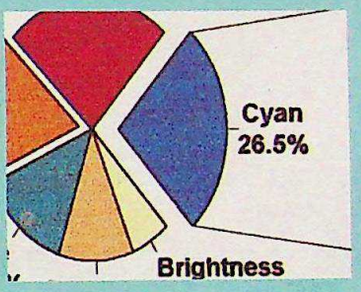
...P DESKJET 600C *Black-...d-white samples are excep...nal, but colors on the pie ...rt came out muted and ...accurate. The photo, ...ough a little dark at the ...fault setting, is good for a ...nter in this price range.*

...P DESKJET 682C *Black ...xt is clear and sharp, and ...ay-scale images are con...stent. Color graphics are ...e, with a clear focus. The ...own photo had a higher ...solution than most.*

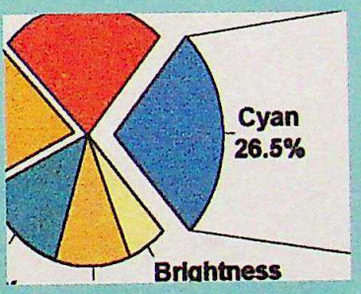
...P DESKJET 820CSE *...xt is excellent—near ...ser quality. Our chart's ...olors are true and main...in good separation. The ...own on glossy paper is ...ch with no muddiness—...e best we saw.*

...EXMARK COLOR JETPRINT-...R 1020 *The text contains ...me fuzziness. The color ...raphic has good satura...on, but the colors are not ...ry vivid. The glossy clown ...age is somewhat grainy.*

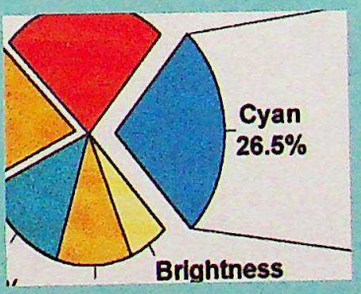
...EXMARK COLOR JETPRINT-...R 2070 *The black-and-...hite sample has only ...inor fuzziness, but there ...hould be none at all. The ...ie shows some dottiness.*

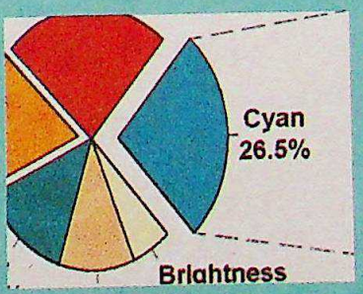


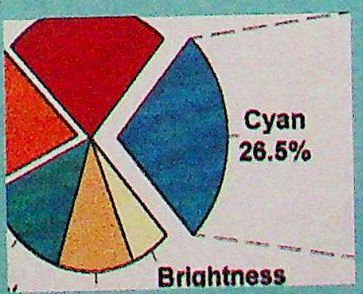








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pensive printer on plain paper. Black text on plain paper was a little fuzzy, but the black-and-white graphic sample was significantly above average on plain paper and particularly praiseworthy on special Epson paper. The IIs also does well on color graphics and color photo reproduction, with fairly good output on plain paper and exceptionally clear print on Epson stock.

Cost per page is a weak point. The unit is rated at 5 cents per page for 5-percent-black coverage, but our drain testing indicated a cost closer to 6 cents per page—the highest cost in this roundup. Printing in color, which Epson rates at 12 cents per 15 percent page, calculated to a high 22 cents on drain tests.

REPORT CARD

Epson Stylus Color IIs

Output quality	B
Ease of use	A
Speed	C
Cost of operation	C
Warranty and support	A

Overall, the Epson Stylus Color IIs is a reasonably capable family printer. It produces good output for a three-color printer, though its low purchase price could be offset by higher costs per page for families that use it often.

Hewlett-Packard Co.

HP DeskJet 600C

Hewlett-Packard's HP DeskJet 600C ($309 list price, $250 street) is the printer manufacturing giant's entry-level three-color ink model. Particularly when printing text on paper and for printing black-and-white graphics, the 600C is less adroit in producing color graphics



A fine threesome: HP's DeskJet 682C, 820Cse, and 600C.

SUMMARY OF FEATURES

Home Printers

■ YES ■ NO

	Canon Computer Systems Inc. **Canon BJC-210**	Canon Computer Systems Inc. **Canon BJC-4100**	Canon Computer Systems Inc. **Canon BJC-610**	Epson America Inc. **Epson Stylus Color IIs**	Epson America Inc. **Epson Stylus Color II**	Hewlett-Packard Co. **HP DeskJet 600C**	PC MAGAZINE EDITORS' CHOICE Hewlett-Packard Co. **HP DeskJet 682C**	Hewlett-Packard Co. **HP DeskJet 820Cse**	Lexmark International **Lexmark Color Jetprinter 1020**	Lexmark International **Lexmark Color Jetprinter 2070**
Estimated street price	$240	$330	$470	$230	$450	$250	$330	$400	$200	$400
Dimensions with paper trays extended (HWD, in inches)	10.3 x 13.6 x 10.5	11.5 x 16.0 x 19.5	11.0 x 14.4 x 22.8	10.3 x 15.3 x 20.6	14.5 x 17.0 x 24.5	7.5 x 17.0 x 17.3	7.8 x 17.0 x 16.0	8.9 x 17.2 x 16.0	11.7 x 14.5 x 9.4	13.5 x 20.5
Jets for monochrome/color	64, 48	64, 72	64, 192	64, 60	64, 60	48, 48	48, 50	300, 192	52, 48	124, 96
Maximum color graphics resolution (dpi)	720 x 360	720 x 360	720 x 720	360 x 360	720 x 720	600 x 300	600 x 300	600 x 300	600 x 300	600 x 300
Parallel/serial port	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Macintosh-colpatible	■	■	■	■	■	■	■	■	■	■
Maximum paper width (inches)	9.5	9.5	9.5	8.5	8.5	8.5	8.5	8.5	8.5	9.0
Paper input capacity (sheets)	100	100	100	100	100	100	100	150	100	150
Prints on card stock/overhead transparencies	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Prints on legal paper/ envelopes	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Windows 95 driver included	■	■	■	■	■	■	■	■	■	■
Low-ink alert (hardware/ software)	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Application software included	Canon Creative for Windows (Crayola Art, Hallmark Connections)	Canon Creative for Windows (Crayola Art, Hallmark Connections)	Canon Creative for Windows (Crayola Art, Hallmark Connections)	Print Artist 3.0, Storm EZ-Photo 1.1	Print Artist 3.0, Storm EZ-Photo 1.1	None	HP Home Project Kit (includes PrintPaks Family Fun Kit)	Microsoft Publisher for Windows 95	CorelDraw 3.0	CorelDraw
3-color or 4-color printing	3-color	4-color	4-color	3-color	4-color	3-color	4-color	4-color	3-color	4-color
Cost per high-capacity black-ink cartridge	$25.00	$29.00	$12.25 (tank replacement)	$25.00	$25.00	$32.95	$32.95	$32.95	$32.95	$35.95
Cost per color cartridge	$35.00	$21.00	$8 (tank replacement)	$38.00	$38.00	$34.95	$34.95	$35.95	$38.95	$35.95
Vendor's rated cost per page:										
With 5% black coverage	5 cents	3 cents	2.5 cents	4.5 cents	4 cents	4 cents	3 cents	3 cents	3 cents	3 cents
With 15% color coverage	17.5 cents	13.5 cents	7 cents	12 cents	12 cents	12 cents	12 cents	8 cents	19 cents	17 cents
Warranty (parts and labor)	2 years	2 years	2 years	2 years	2 years	3 years	1 year	1 year	2 years	2 years
Overnight exchange of defective unit	■	■	■	■	■	Optional ($49)	Optional ($49)	Optional ($49)	■	■
Toll-free technical support	■	■	■	■	■	■	■	■	■	■

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BENCHMARK TESTS

Color Ink Jet Printers

The costlier ink jet printers for home use aren't necessarily faster. But you do get better print quality when you buy a vendor's higher-priced printers.

What the Numbers Mean

The HP DeskJet 820Cse, from Hewlett-Packard, and the Color Jetprinter 2070, from Lexmark International, were the fastest units overall in our speed testing. The HP DeskJet 820Cse is the first HP printer to use the company's new Printing Performance Architecture. This is an integrated cross-platform firmware and software design that effectively doubles ink jet performance and directly benefits from HP's work with Microsoft on the Windows 95 printing subsystem. The Color Jetprinter 2070 incorporates Lexmark's newest host-based driver, so many time-consuming processes are achieved using the computer's processor and RAM. Lexmark has also doubled the number of print heads from earlier models, increased firing frequency by 40 percent, and speeded up paper-feeding, all of which combine to make printing faster.

The Canon BJC-610 was among the slowest on our speed tests. But with 192 jets, the BJC-610 gives up printing speed in favor of higher-quality output.

Results on our Ink Drain tests are affected by the quantity of ink in the tanks and the way in which ink is squirted onto the page. We used these results to calculate the per-page costs cited in the reviews.

How We Tested

We tested all printers on an HP Vectra XU 5/90—a 90-MHz Pentium with 16MB of RAM and a 1GB hard disk that was running Windows 95.

We timed the speed tests with a stopwatch and ran each one twice, after defragging and rebooting the computer. If the test results differed by more than 5 percent, we ran the test again.

The **Microsoft Word for Windows 95** test measures a printer's speed in producing a two-page text document created in Microsoft Word for Windows 7.0. The document used a variety of fonts and text features.

The **Microsoft Publisher for Windows 95** test measures a printer's speed in producing a monochrome one-page newsletter that contains a gray-scale photograph, a gradient-fill background, black page elements, and text.

The **Color Graphics** test measures a printer's speed in producing a one-page document that contains both black and color text, multicolor charts, color-gradient bars, and the PC Magazine Labs logo.

The **Ink Drain** tests measure how many pages you can expect from a printer's color and black cartridges wear out. We created pages of solid bars that covered 50 percent of an 8.5- by 11-inch page. For each test we started with a new cartridge that we properly installed and cleaned or aligned using the manufacturer's recommended procedures. We printed pages continuously until the bars began to streak and fail noticeably.—*Analysis written by Bruce Brown*

	Microsoft Word for Windows 95	Microsoft Publisher for Windows 95	Color Graphics	Ink Drain	
	Minutes:seconds	Minutes:seconds	Minutes:seconds	Black ink Number of pages	Color ink Number of pages
Canon BJC-210	1:13	2:14	3:19	104	108
Canon BJC-4100	1:17	2:56	2:38	85	51
Canon BJC-610	2:43	1:37	2:08	44	108
Epson Stylus Color IIs	2:41	1:44	6:26	39	52
Epson Stylus Color II	1:40	1:01	2:35	55	76
HP DeskJet 600C	1:23	1:23	2:02	75	144
HP DeskJet 682C	1:31	1:31	2:52	66	149
HP DeskJet 820Cse	0:39	1:54	1:47	102	215
Lexmark Color Jetprinter 1020	1:49	1:09	3:12	69	90
Lexmark Color Jetprinter 2070	0:47	0:59	1:45	68	105
	↓BETTER	↓BETTER	↓BETTER	BETTER↓	BETTER↓

lor photo output. Still, this it is a safe bet for families o want a budget printer om the biggest name in the siness.

Maximum graphics resolun for the 600C is 600 by 300 pi, but you'll need high-uality paper to use that ode. The paper input tray olds 100 sheets and also ndles envelopes and a variety of paper stock. HP includes its complete and well-organized printer software driver but none of the extra family-fun applets that users have come to expect in this market segment.

The documentation is comprehensive, although you won't find the same level of user aids as Canon or Epson provides. Setup is straightforward, but should you need help, you'll have to make a toll call to get live HP tech support.

REPORT CARD

HP DeskJet 600C

Output quality	B
Ease of use	A
Speed	B
Cost of operation	B
Warranty and support	B

Text samples printed on plain paper had crisp, clear letter and were rated the highest of the ten printers reviewed here. Monochrome graphics samples were also good, with no visible banding. Color reproduction in graphics printing appeared to be somewhat off, even though we tried several different ink cartridges. Colors were more accurate (though a little dark at default settings) on our color photograph print

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samples. In all cases, using special coated stock yielded much better results.

Our ink drain tests pegged costs per page for the 600C at a competitive 4 cents for 5-percent-black coverage and just 7 cents for 15-percent-color—even lower than HP's estimate of 12 cents. Black-ink cartridges cost $32.95, and color cartridges cost $34.95. The 600C comes with a generous three-year warranty. A $49 option buys HP's Express Exchange option for free unit-swapping if your printer fails during the warranty period.

A safe bet, the HP DeskJet 600C is a competent printer. Though not as good at printing color as the Epson Stylus Color IIs and the Lexmark Color Jetprinter 1020 (three-color printers), no other printer in this roundup did a better job with black text.

REPORT CARD

HP DeskJet 682C

Output quality	A
Ease of use	A
Speed	B
Cost of operation	B
Warranty and support	B

Hewlett- Packard Co.

HP DeskJet 682C

Hewlett Packard's four-color HP DeskJet 682C will cause a major ripple in the ink jet community. because it is the first ink jet printer that can print on fanfold paper. Now you can make colorful banners that are 20 feet long or a spreadsheet just as wide. With a highly competitive street price of $330, the 682C is a bargain and is a step up from the HP DeskJet 600C.

PC MAGAZINE EDITORS' CHOICE

To print on fanfold paper, simply move one lever on the paper-input tray and put in up to 20 sheets. The printer's mechanical parts hold the paper so that output stays consistent.

Output quality is another hot feature of HP's DeskJet 682C. Black text is clear and sharp, and black-and-white images are good. Color output on coated stock showed rich, true colors, and photos retained detail well.

The 682C comes with the HP Home Project Kit, which includes Disney's Mickey and Friends Print Studio CD-ROM and the Family Fun Kit CD-ROM by PrintPaks. Sample paper stock is also included.

HP rates the 682C's cost per page at around 3 cents for 5-percent-black printing and 12 cents for printing with 15 percent color. In drain testing we found the cost to be a nickel for black but a competitive 7 cents for color. The 682C uses the same cartridges as the 600C—the cost is $32.95 for black and $34.95 for color.

The standard warranty for the DeskJet 682C is one year, and a $49 option extends coverage for three years and includes HP's Express Exchange program. Again, you must make a toll call to get live support.

With great paper handling, terrific output, and a low operating cost, the HP DeskJet 682C is the printer of choice.

Hewlett-Packard Co.

HP DeskJet 820Cse

Hewlett Packard's four-color HP DeskJet 820Cse ($486 list price, $400 street) is the best in its class. It's fast, produces excellent output, and has the lowest cost of operation of the tested printers. If you'll be using your home printer for business as well as family use, seriously consider the DeskJet 820Cse.

The 820Cse uses the same case and print engine as its 800-series stablemates, the SOHO-oriented DeskJet 855 and 855Cse. The extra-capacity paper-input tray holds 150 sheets (equaled in this roundup only by the Lexmark Color Jetprinter 2070). The top graphics resolution is 600 by 600 dpi in black and 600 by 300 in color. HP includes a desktop publishing package, Microsoft Publisher for Windows 95, driving home the point that this is a more serious-minded home ink jet.

REPORT CARD

HP DeskJet 820Cse

Output quality	A
Ease of use	A
Speed	A
Cost of operation	A
Warranty and support	B

Like all the other printers in this roundup, the 820Cse does its best work on special papers. Unlike the others, though, it does a fine job on plain paper, as well. Monochrome and color graphics and even color photographs looked good on plain paper, without banding, over-sized dots, or off colors. The fastest printer in this review (tied with the Lexmark Color Jetprinter 2070), the 820Cse does it all.

HP rates the 820Cse at 3 cents per 5-percent-black page and 8 cents per 15-percent-color page, but our drain testing proved it to be even better, averaging 3 cents for black and a class-leading 5 cents for color printing. Replacement ink cartridges, the same cartridges used in the other 800-series printers, [illegible] $32.95 for black and [illegible] for color ink.

For $60, you can [illegible] the standard one-year [illegible] ranty for three-year cover[illegible] and Express Exchange [illegible] vice. Alas, live technical [illegible] port requires a toll call.

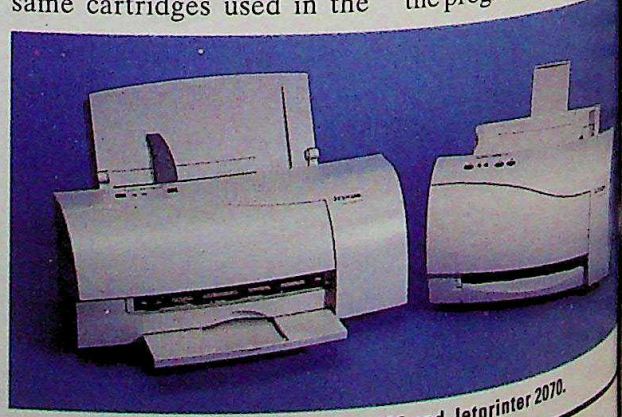
The HP DeskJet 820C[illegible] fast, cost-effect[illegible] and prints co[illegible] tently high-q[illegible] output in [illegible] modes and o[illegible] types of pape[illegible] you aren't e[illegible] ored with ba[illegible] printing or Disney free[illegible] then this is the printer for [illegible]

Lexmark International Inc.

Lexmark Color Jetprinter 1020

The least expensive [illegible] printer in this re[illegible] ($249 list price, $[illegible] street), the three-color L[illegible] mark Color Jetprinter [illegible] isn't very fast, but setup an[illegible] eration are simple, and p[illegible] quality is acceptable. If y[illegible] budget is tight, be sure to l[illegible] at this unit.

The compact Color J[illegible] printer 1020 delivers 60[illegible] 300-dpi resolution on sp[illegible] stock, though for most jo[illegible] 300-dpi mode will su[illegible] CorelDraw 3.0 is included [illegible] while this is an older versio[illegible] the program, its graphics a[illegible]



High and low: Lexmark's Jetprinter 1020 and Jetprinter 2070.

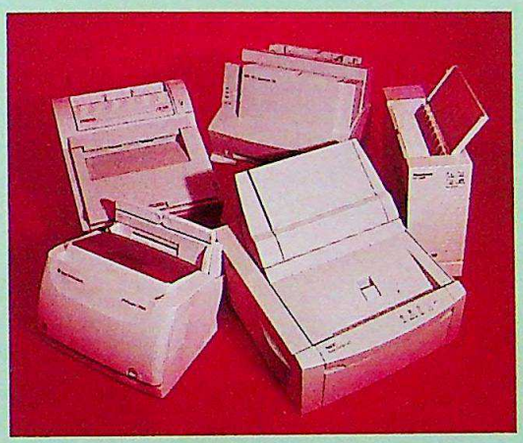
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Low-Cost Lasers: Better Quality, No Color

Color ink jet printers are a wonderful choice for all-purpose family use, but for black-and-white documents, even the best ink jets still can't match the crispness of a laser printer. So if you need a home printer primarily for business-quality monochrome printing—say, for term papers, newsletters that will be photocopied, or documents for work—one of the low-cost lasers printers now on the market might be a better choice.

Personal laser printers are affordable (there are at least a half-dozen priced around $500), compact, and quiet, and they cost less to operate than ink jets—around 2 cents for a typical text page versus 5 cents for the average ink jet monochrome page. All five of the suitable low-cost lasers we reviewed offer simple setup and user-friendly software that adds special touches, such as background watermarks on pages and the ability to produce booklets and thumbnails of documents.



Since color laser printing won't come to the home this century (unless your mailbox says B. Gates and you can shell out anywhere from $5,000 to $12,000), you have to be certain you want to walk away from the color capability an ink jet delivers. Or you could buy one of each.

One of the newest entries in this fast-growing market segment is the **NEC SuperScript 860,** from NEC Technologies. This printer raises the bar for home and SOHO lasers, delivering an impressive 8-page-per-minute (ppm) rated engine speed (competitors in this class have speeds of 4 and 6 pages per minute) and true 600-dpi resolution. NEC's edge-sharpening algorithm and super-fine toner particles mean text and graphics that are clean and precise. The big news, though, is behind the scenes. The SuperScript uses the recently released Adobe PrintGear printer description language (the instruction set that translates data from the host PC into the text and images you want on paper). Adobe claims that the language is optimized for the type of print jobs SOHO users need and that it costs less for manufacturers to add than either of the competing languages, PCL or PostScript. At just $500 on the street, the 8-ppm SuperScript is a compelling choice.

It has to be if it's going to compete with the best-selling printer the world has ever known, the **HP LaserJet 5L** ($480 street price), from Hewlett-Packard. The LaserJet 5L was a *PC Magazine* Editors' Choice honoree in our most recent roundup of personal laser printers. It has a slower engine than some others (just 4 ppm), but its 600- by 600-dpi capability is unsurpassed, and its compact size (about 9 by 13 by 12, HWD) makes it an ideal choice for cramped spaces.

If space and money are really tight, consider the **TI microLaser WIN/4** ($380 street price), from Texas Instruments. The smallest printer of this small group, measuring just 8 by 12 by 11 inches and weighing a mere 11 pounds, the microLaser looks like an oversized toaster. A 600-dpi, 4-ppm printer, the microLaser uses Microsoft Windows Printing System language. That means it relies on the host PC to do most of the processing, so you'll need a 486 or better PC with at least 8MB of RAM to run it.

The **Panasonic KX-P6500** ($500 street price), has a 600-dpi laser engine and is rated at 6 ppm. Unusual in shape, the KX-P6500 saves desk space by standing upright, needing a space only 5 inches wide by 15 inches deep at its base. Like the microLaser, the KX-P6500 relies on the host PC's resources to print from Windows.

One of the best bargains around is from Okidata: the **Okidata OL600e,** at just $400 on the street. Its 6-ppm engine produces 600 dpi using LED (light-emitting diode) technology instead of a laser beam, but you won't notice the difference in output. If you want laser quality but are watching every penny, the Okidata should fit the bill.—*BB*

cations will likely be new and eful to most home users.

Lexmark's GDI interface is pleasure to use. You can control all printer operations except page-feeding from your PC and, via a bidirectional parallel port and printer cable, you can view the progress of current print jobs and also observe the ink level in the current cartridge. The driver also includes voice prompts, using a pleasant female voice that plays through your computer speaker to alert you to low ink status or to let you know when you're out of paper.

Lexmark Color Jetprinter 1020

Output quality	B
Ease of use	A
Speed	B
Cost of operation	B
Warranty and support	B

Black text printed on plain paper looked a little fuzzy, and monochrome graphics samples had minor but visible banding. The color in color graphics print samples was not very vivid and somewhat muted. The big surprise, given the unit's three-color print head, was the high quality attained when we printed our color photograph sample on expensive glossy stock. This print was less focused on plain and coated stock. Investing in upgraded plain-paper stock for everyday printing will pay off in the long run with this printer.

Lexmark rates the Jetprinter 1020 at a reasonable 3 cents per page for 5-percent-black coverage and a high 19 cents for 15-percent-color

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coverage; our drain tests put it at a high 5 cents for black and a reasonable 13 cents for color. Go figure. Replacement cartridges cost $32.95 for black and $38.95 for color ink.

Lexmark offers a generous warranty program, with two-year coverage and a no-cost overnight-exchange policy should your printer fail. The only downside is that live technical support, as with HP, requires a toll call.

The Lexmark Color Jetprinter 1020 is a good choice if your budget is limited and you want the most for your money. On a par with the Canon BJC-210, the Jetprinter 1020's lower price and slightly better print quality gives it the edge.

Lexmark International Inc.

Lexmark Color Jetprinter 2070

Lexmark's four-color Color Jetprinter 2070 ($549 list price, $400 street) is fast, relatively inexpensive to use, and prints consistently good output. On a par with the Canon BJC-610, Epson Stylus Color II, and HP DeskJet 820Cse, this high-end home printer has few faults.

The Jetprinter 2070 is capable of a 600- by 600-dpi graphics resolution for both monochrome and color printing. It has a 150-sheet paper tray and comes with Corel Draw 4.0, a graphics application collection one step above the set included in the 3.0 Version bundled with the low-cost Color Jetprinter 1020. Setup and installation are thankfully uneventful, with a quick-start guide and thorough documentation, plus tabbed-page print job control software.

REPORT CARD

Lexmark Color Jetprinter 2070

Output quality	A
Ease of use	A
Speed	A
Cost of operation	B
Warranty and support	B

Black-text printing is good, with only minor fuzziness on plain paper, and monochrome graphics samples had barely discernible banding, but were grainy; both monochrome print samples were fine for a home printer. The Jetprinter 2070 did an above-average job printing our color graphics test samples. The output was judged a close second to that of the class-leading HP DeskJet 820Cse. Surprisingly, the 2070's color photo print-out on glossy paper didn't look as good as its cheaper sibling's, though the 2070 had a clear edge on plain paper and coated stock.

Our drain testing resulted in calculated per-page costs of 5 cents for black printing and 11 cents for color, which makes this an affordable unit to run. Replacement ink cartridges cost $35.95 and $39.95 for black and color, respectively.

As with its Color Jetprinter 1020, Lexmark provides a two-year warranty with free exchange in case of failure, but there is no toll-free technical support.

The Lexmark Color Jetprinter 2070 is a fine printer, cost-competitive with the top Canon, Epson, and HP models and faster than both the Canon BJC-610 and the Epson Stylus Color II. Print quality, while very good, didn't quite meet the level set by the HP DeskJet 820Cse in our testing, but it was close enough that most families won't notice or care. ■

Tracking Down The Players

Canon Computer Systems Inc., Costa Mesa, CA. *Canon BJC-210/4100/610 – Price: Rs12,700/24,500/39,600 respectively. (Indian partners HCL-GA, Nicolas Network, New Delhi.)*

Epson America Inc., Torrance, CA. *EPSON Stylus Color IIs/Color II – Price: Rs 13,500/23,500 respectively. (Indian partners Digital World, Reliance, Bombay; Wipro, Bangalore.)*

Hewlett Packard Co., Santa Clara, CA. *HP DeskJet 600C/682C/690C – Price: Rs 21,200/26,000/26,000 respectively. (Indian subsidiary Hewlett-Packard India, New Delhi; partners CMS, Bombay; ECIL, Hyderabad; Godrej Pacific, Bombay; HCL-HP, New Delhi; L&T, Bombay; PCL, New Delhi; Redington, Zenith Computers, Bombay.)*

Lexmark International Inc., Greenwich, CT. *Lexmark Color Jetprinter 1020/2070 – Price: Rs 18,500/27,[illegible] respectively. (Indian partners Alphabetics, New Delhi; CMS, Bombay; Indmark Infocom, TVS, Bangalore.)*

Ink Jet Accessories: Dream in Color

Henry Ford could never have envisioned drive-in theaters when he started churning out automobiles. Likewise, the designers of the first color ink jet printers couldn't possibly have anticipated the wide array of accessories that would make these printers ideal for more than just printing pie charts.

To help you and your kids get the most out of your printer, consider the PrintPaks Window Art Kit ($19.95), from PrintPaks, and Print Shop Deluxe II ($49.95), from Broderbund. These packages improve on standard banner- and card-making software by adding wild and colorful new crafts you can make with your kids. Create iron-ons, ornaments, refrigerator magnets, and suncatchers without any crayons or markers to clean up.

If you would rather decorate your print-outs with those summer vacation photos, consider the EasyPhoto Reader photo scanner (with software, $250), from Storm/Primax. About the size of an electric pencil sharpener, the EasyPhoto will have you converting your entire library of photo albums into JPEGs in no time. Simply install the easy-to-use software, plug the scanner into your parallel port, insert a photo, and press the big green Start button.

Those photos and all your other output will look their best when printed on paper specially formulated for ink jet printers. Rexam Graphics markets a range of quality stock, including a brand-new line of resin-coated papers designed to keep your colorful graphics from bleeding or fading. And the Paper Direct catalog contains a huge assortment of specialty papers: faux marble or granite stock, paper with cool borders, even a handy three-panel pamphlet template complete with punch-out Rolodex card.—*David R. Lambert*

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The Windows 95 Service Pack 1

What fixes and new features will it give you?

By Sheryl Canter

The quiet release of the Microsoft Windows 95 Service Pack 1 was a far cry from the original Windows 95 launch extravaganza, but its bug fixes, new components, new and updated device drivers, and updated tools for system administrators are well worth having. The new components include Microsoft Internet Explorer 2.0, Windows NT Server Management Tools for Windows 95, and an update to Microsoft Exchange that lets you access Microsoft Mail shared folders. Many of these fixes and tools have been available for downloading for some time, but Service Pack 1 brings them all together in one place.

If you are enrolled in Microsoft Select, Microsoft TechNet, or Microsoft Developer Network Level II, you will automatically receive Service Pack 1 with your next scheduled edition. You can also download it from the Internet (*http://www.microsoft.com/windows*), MSN (GO Windows), and CompuServe (GO WinNews). You can order CD-ROM or disk versions directly from Microsoft for $14.95.

To install the core portion of Service Pack 1—the essential bug fixes to the operating system itself—you simply run Setup, and your operating system is upgraded to Version 4.00.950a (Win95A). The only obvious change you'll see after running Setup is a new icon in your System Tools folder called Update Information Tool (see Figure 1). This handy applet tells you exactly which components have been updated in your system and in your registry and gives their version numbers. If you select the Updated Files Found page, the Update Information Tool scans your hard disk for upgraded components; it's a helpful diagnostic tool if something isn't operating correctly.

Running Setup does not install the new components, the administration tools, or the server portion of the service pack; you must install each of these separately. Detailed instructions for doing so are included in README.TXT and documentation files.

THE CORE UPDATE

The core portion of Service Pack 1 consists of an OLE32 update, a shell update, a common dialog update for legacy printer drivers, a printer port update for bidirectional communications with certain printers, a password list update that improves security, a System Agent update, and various security fixes for specific types of networks.

The OLE32 update fixes a problem that could cause some embarrassment—or worse—when you share files created with the Windows 95 versions of Microsoft Word, Microsoft Excel, or Microsoft PowerPoint. Those applications all use OLE for file storage, and because of a bug in the original version of OLE32, information you thought you had deleted might still be visible when your file is viewed with another editor, such as Notepad. A similar problem exists under Windows 3.1 if you're using Word 6.0, Excel 5.0, or PowerPoint 4.0. The "C" releases of those products fix the problem.

The shell update, which replaces Shell32.dll, lets those using NetWare Directory Services (NDS) browse NDS printers from the Add Printer wizard, which is found in the Printers folder. It also corrects a problem that causes files copied onto themselves to be truncated to 0 bytes under certain conditions.

The common dialog update for Windows 3.1 legacy printers corrects a problem that occurs when you print from 32-bit applications using monolithic drivers or the pscript.drv/unidrv.dll driver. An update to Lpt.vxd adds support for the Extended Capabilities Port (ECP) bidirectional communications offered by HP LaserJet 4- and 5-series printers and some Lexmark LaserPrinters. The fix prevents timeout errors during printing. (Actually, the Lpt.vxd update was included on the original Windows 95 CD-ROM, but it wasn't installed during default setup.) When you connect to a password-protected resource such as a network drive, you can choose to save your password so you're not prompted again in the future. Passwords are stored in an encypted file. The password list update corrects a weakness in the password file encryption scheme that was exposed when someone posted a decryption algorithm on the Internet. According to Microsoft, the update provides encryption that is harder to crack than the original method by a factor of 2^{96}.

The System Agent update, which is actually an update to the Plus! pack, replaces Sage.dll. When System Agent 1.0 is running, programs that perform floating-point calculations may be slightly off in precision. The update corrects this problem.

The network updates include a variety of fixes, mostly involving security, that affect users of specific networks. The Vserver update fixes a file- and printer-sharing security problem on Microsoft Networks that occurs with

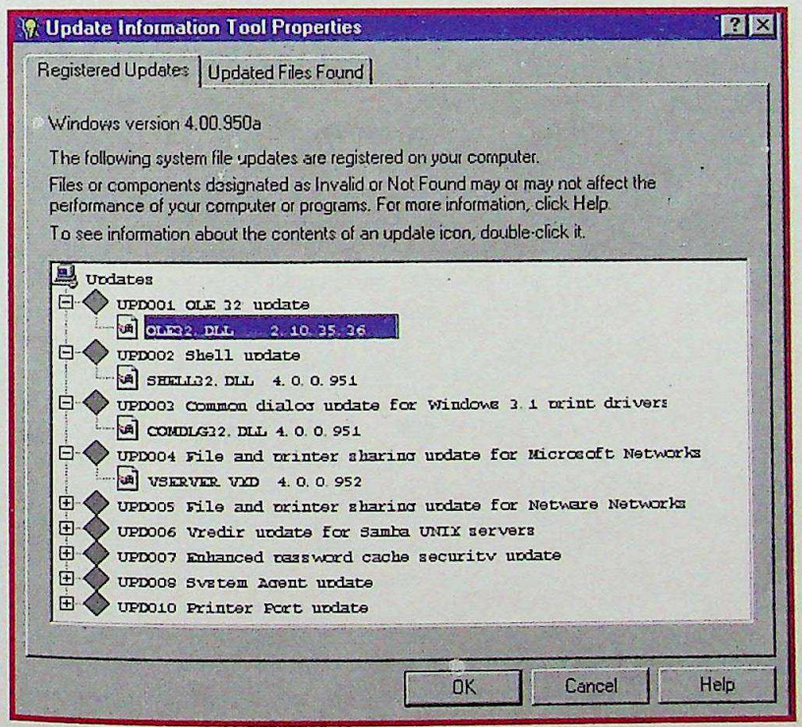


FIGURE 1: *The Update Information Tool lists the operating system updates registered on your system.*

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smbclient, the network client component of the freeware Unix-based suite Samba. Windows 95 lets smbclient users gain unauthorized access to the drive on which sharing is enabled by accepting certain networking commands. This isn't as bad as it sounds. Users don't have automatic access to the drive and they must know exactly what steps to take, so the security hole isn't gaping. But this fix prevents Windows 95 from accepting these commands and thus prevents smbclient users from accessing the drive. Access is restricted, as it should be, to only those folders that the Windows 95 user has designated as shared.

The NWServer update corrects a file- and printer-sharing security problem on NetWare networks. The security hole occurs if your computer is configured for file and printer sharing and Remote Administration is enabled. After the administrator has logged off your computer and before you have restarted it, another user on the network can gain read-only access to your hard disk. The updated driver closes this security hole and lets only valid administrators access the drive.

The Vredir update fixes a file-naming problem that affects Windows 95 users who use the Samba Unix server. The problem occurs because although Windows 95 and Unix both allow the use of the backslash and asterisk in file specifications, those characters have different meanings for each operating system. In Unix they are legal filename characters, and in Windows 95 they have special functions. So if a Samba server contains a file named \server\share*.* and a Windows 95 user tries to delete the file *.* from Explorer, all the files in the directory \server\share will be deleted. The Vredir update solves this problem by disallowing server filenames that contain the \ or * characters.

NEW COMPONENTS

The new components of Service Pack 1, which can be found in the \ADMIN\COMPONTS folder on the CD-ROM version, include Microsoft Internet Explorer 2.0, scripting and SLIP (Serial Line Internet Protocol) support for the Dial-Up Networking tool, Microsoft Word Viewer 7.1, an infrared driver, a 32-bit DLC (Data Link Control) protocol, service for NDS, an update to Microsoft Exchange, and Service Pack 1 setup programs for use by network administrators.

Internet Explorer 2.0 offers a number of new features, including support for HTML tables. It also adds a basic newsgroup reader. (There was no newsgroup support at all in Version 1.0.) New multimedia features include support for background sounds, scrolling marquees, and inline video. Its performance has been improved by several methods. For example, text is now displayed immediately, with placeholders for graphics, so you don't have to wait for the program to download them before you can click on a link. Security has been enhanced, as well, with support for Netscape's Secure Sockets Layer (SSL) encryption.

The Microsoft Word Viewer 7.1 lets you view and print files created with Microsoft Word for Windows without having Word on your hard disk. Although you cannot edit the files, you can copy information from them to the clipboard, and you can activate OLE objects embedded within them. If you have Word 6.0 or later on your hard disk, the installation program will ask you whether you want to launch Word Viewer or Word when you double-click on .DOC files.

The new Infrared Driver lets you use IrDA devices for wireless connections to peripherals or other Windows 95 computers. The new 32-bit DLC protocol, which supports both 32-bit and 16-bit DLC programs, lets you access IBM mainframe and IBM AS/400 computers. With Service Pack 1, Windows 95 provides full client support for NDS through Service for NDS and Client for NetWare networks.

In addition to these new components, there are updates to four components in the \ADMIN\COMPONTS\UPDATES folder: Microsoft Exchange, Netsetup, Prompted Update, and Silent Update. The update to Microsoft Exchange lets users access Microsoft Mail shared folders. (The Microsoft Mail information service included with Windows 95 does not provide access to shared folders.) After you install this upgrade, you must reconfigure Exchange to take advantage of the new feature.

Netsetup, a tool for network administrators whose users are running Windows 95 from the server, updates the distribution point on the server with the Service Pack 1 files. The two versions of the Setup program, Prompted Update and Silent Update, are for networks where users are running Windows 95 from their hard disks. The Prompted Update program asks users whether they'd like to install the update and reminds them to restart their systems after the updates have been completed. The Silent Update doesn't prompt users to confirm the updates or to restart their systems; it simply copies the files. The tools for setting up these options are stored in \ADMIN\TOOLS\SMS on the CD-ROM.

NETWORK MANAGEMENT TOOLS

The administration tools, found in \ADMIN\TOOLS on the CD-ROM version, help network administrators upgrade users on their networks to Win95A. They include Windows 95 Support Assistant, Batch Setup 2.0, INF Generator Tool, INF Installer Tool, and Windows NT Server Management Tools for Windows 95.

The Support Assistant is a Help file that contains information relevant to installing Service Pack 1 on a network. Included are a FAQ (Frequently Asked Questions) file, the Windows 95 Resource Kit section on networks, some Knowledge Base articles on networking, procedures for troubleshooting application and hardware compatibility, a guide to products and services, and a glossary of Windows 95 terms.

The Batch Setup utility helps administrators update many computers on a network at once. Version 2.0 adds a variety of new features. You can have Batch Setup scan your Windows 95 Registry and create an .INF file based on your current settings. Also with Batch Setup you can specify which protocols make the default, enable or disable all optional components with a single mouse click, configure file and print services for Microsoft networks, enable or disable the Plug and Play card Resource Conflict Resolution Wizard during setup, find user-level security settings and locate client TCP/IP settings, such as DNS servers.

The updated INF Generator Tool lets you choose separate settings for companies, departments, and individual users. This feature is especially useful when using static TCP/IP settings rather than the Dynamic Host Configuration Protocol (DHCP). The INF Installer Tool lets you integrate .INF and related files from the various \ADMIN\TOOLS directories for easier installation.

The Windows NT Server Management Tools for Windows 95 provide basic server tools (Server Manager, User Manager, and Event Viewer) that let you manage Windows NT servers from Windows 95 client machines.

EVEN MORE DRIVERS

The last big category in Service Pack 1 is third-party device drivers. New or updated drivers are supplied for sound cards, display adapters, modems, network cards, printers, SCSI controllers, PCI buses, Mouse System mice, and various UPSs. New drivers are developed all the time. The drivers on the CD-ROM and disk versions of Service Pack 1 are a snapshot of what was available when the CDs or disks were created. To be sure you have the most recent drivers, you should check one of Microsoft's online sites.

Anyone running Windows 95 should take the time to install Service Pack 1, if only for the plugs to security gaps. Although you won't need every fix and feature, you're bound to find at least one or two that affect you, and you can obtain Service Pack 1 at little or no cost.

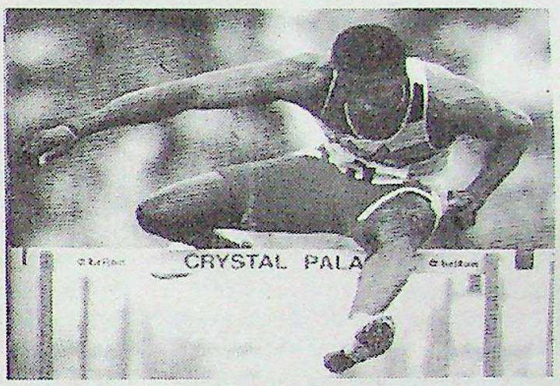
Microsoft Windows 95 Service Pack 1. List price $14.95 in CD-ROM format, downloadable for free. Microsoft Corp., Redmond, WA; in Canada; http:// www.microsoft.com/ windows. *(Indian subsidiary Microsoft India, New Delhi; Indian partners Datapro, Pune; Godrej Trueline, Bombay; Sonata, Bangalore; TUL, Bombay.*

Sheryl Canter is a contributing editor of PC Magazine.

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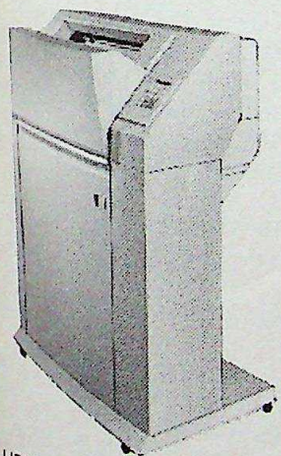
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IT'S RATHER TOUGH. BUT THEN, LIPI LINE PRINTERS ARE THE FASTEST IN ITS LOT. AND OF COURSE, A LEADER IN EVERY OTHER WAY. ONE LOOK AT THEIR FEATURE WILL MORE THAN CONVINCE YOU.



LIPI MT 691-1400 lpm printer

* **Proven reliability :** Thousands of installations in India against only a handful from competitors.
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* **Superior Paper Transport :** 4 tractors for reliable and fast paper movement. And reverse paper motion for printing graphics. Competition has only 2 tractors.
* **Multiple Interface :** Simultaneously active serial and parallel shared interfaces with auto-switching. Competition requires selection from the front panel.
* **Ethernet :** In-line ethernet interface for networking.
* **Pepped-up speed :** 17.5 inch carriage of Lipi printers has 1.5 inch of added carriage width to accommodate large sized forms like two Bank Cheques / Share Certificates printed abreast, thus doubling the throughput as compared to the competition. This gives the advantage of having two printers for the price of one.
* **Multilingual :** Ease of connectivity for Multilingual Printing.
* **Reach :** Extensive All India sales & service network from over 30 locations.

Lipi has Computer Printers for every requirement from 300 cps to 2000 lpm in all technologies.

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By Paul Modzelewski and Gyorgy Grell

Using the DirectDraw API with C++

A primer on Windows 95's new game programming interface.

DirectDraw, the graphics component of Microsoft's new Game SDK, is a powerful new tool that finally gives developers low-level access to the millions of accelerated video cards in today's PCs. In this first of two installments, we will discuss exactly what DirectDraw is, as well as how you might use it. In the next article, we will introduce a game we have written using DirectDraw, along with the reusable C++ classes our game uses.

The DirectDraw API allows "direct" access both to video memory and to the graphics acceleration hardware built into most video cards sold in the last few years. DirectDraw supports a vast array of functionality, but many of its features are not yet supported by existing video cards or drivers.

Currently, DirectDraw has three main benefits. The first is *hardware blitting*, which is the ability to use the blitter on the video card to copy images from one area of video memory to another. In addition to standard blits (or *bit block transfers*), DirectDraw supports *transparent blits*, which ignore all pixels of a designated color, so they don't show up in the destination. Since hardware blits are performed asynchronously, the CPU is free to handle other chores.

The second benefit is *page flipping*, which involves creating two or more "screens": a front page and one or more back pages. The front page is the one currently displayed, and the back page is hidden from sight. All rendering is done on the back page, and when the image is complete, the pages are flipped: The newly drawn back page, now visible, becomes the front page. Conversely, the former front page is now the back page, and the next screen can be rendered on it.

The final advantage of DirectDraw is *color filling*. Color fills are like hardware blitting, but in this case the hardware fills a specified area of video memory with a single color. This can be handy for erasing sprites or entire pages.

THE DIRECTDRAW API

Function	Purpose
DirectDrawCreate	Creates an instance of a DirectDraw object.
IDirectDraw::SetCooperativeLevel	Determines the level at which the DirectDraw application cooperates with the GDI. Defines use of the entire screen (Exclusive mode) or only part of it.
SetDisplayMode	Sets the screen resolution and color depth. Works only with Exclusive-mode access.
IDirectDraw::CreateSurface	Creates a DirectDrawSurface and associates it with a DirectDraw object.
IDirectDraw::CreatePalette	Creates a DirectDrawPalette and associates it with a DirectDraw object.
IDirectDrawSurface::SetPalette	Attaches a DirectDrawPalette to a DirectDrawSurface. The surface will use the palette for all operations. The change to the surface is immediate.
IDirectDrawSurface::BltFast	Performs a source-copy blit or transparent blit using a source or destination color key. Works only on video memory surfaces and cannot clip. The software implementation of BltFast is 10 percent faster than Blt. There is no speed difference if the video hardware is being used.
IDirectDrawSurface::SetColorKey	Sets the color key of a surface if the hardware supports it.
IDirectDrawSurface::Blt	Performs a bit-block transfer. Capable of synchronous or asynchronous blits: video memory to video memory, video memory to system memory, system memory to video memory, or system memory to system memory.
IDirectDrawSurface::Lock	Obtains a valid pointer to the surface memory.
IDirectDrawSurface::Unlock	Notifies DirectDraw that the direct surface manipulations are complete.
IDirectDrawSurface::Flip	Makes the surface associated with the DDSCAPS_BACKBUFFER surface become associated with the front-buffer surface. The video memory previously associated with the front buffer is associated with the back buffer.

THE COMPONENT OBJECT MODEL

Before you use DirectDraw, a basic understanding of the Component Object Model (COM) specification is helpful, since all of the Game SDK's components are encapsulated as COM objects. A COM object is a lot like a C++ object, with some important distinctions. You can create an instance of a COM object, call methods of its *interfaces* (the equivalent of member functions), and destroy it when you're done using it. You cannot directly access COM objects' data members, and they do not have constructors or destructors. Usually a creation function is supplied instead of a constructor, and you use the Release method of the fundamental IUnknown interface instead of deleting a COM object.

Once you have a pointer to a COM object, you can call its member functions just as you would with a C++ object, since the COM format is recognized by most Windows C++ compilers. In fact, since the COM interface is effectively hidden by the DirectDraw API functions, we are free to refer to DirectDraw objects as if they were ordinary C++ objects.

You can use COM objects in straight C programs, but it's a little more cumbersome. For instance, in C, you would call a COM object's member function like this:

```
pDDSurface->lpVtable->Flip
  ( pDDSurface, NULL, NULL );
```

In C++, such a call would look like this:

```
pDDSurface->Flip(NULL, NULL);
```

The header files of the Game SDK contain some macros that make access from C less awkward.

SETTING UP DIRECTDRAW

The first step is the creation of a DirectDraw object with the DirectDrawCreate function. The DirectDraw object creates and owns all other objects in the DirectDraw API and is also the means by which you access all global functions, such as setting the display resolution or color depth.

```
hResult = DirectDrawCreate(NULL,
 &pDirectDraw, NULL);
```


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The first parameter is a pointer to a GUID, which represents the driver for which the DirectDraw object should be created. Use NULL if you want the active display device, or you can use DDCREATE_EMULATIONONLY if you want to force the use of software emulation. (You might want to use emulation for debugging or testing purposes, or to make sure your application works in emulation mode. DirectDraw has a hardware emulation layer that emulates some of what might be missing from an actual DirectDraw video driver as well as capabilities not available on a video card, such as the ability to stretch an image.) If DirectDrawCreate succeeds, pDirectDraw will be initialized with a valid pointer to a DirectDraw object, and hResult will be DD_OK. If it fails, hResult returned will be a value other than DD_OK. The last parameter is for OLE2 aggregation features and can be left as NULL.

Once you have a pointer to a DirectDraw object, you need to set the cooperative level and display mode. Calling SetCooperativeLevel tells DirectDraw how friendly you want your application to be to other applications. Most applications using DirectDraw will want exclusive, full-screen access.

```
hResult = pDirectDraw
->SetCooperativeLevel(m_hWnd,
DDSCL_EXCLUSIVE | DDSCL_FULLSCREEN);
```

When you've changed the cooperative level, you then set the display mode. DirectDraw has support for many display resolutions and color depths, but right now the only options that use hardware acceleration are 640-by-480 or 640-by-400 at 8 or 16 bits per pixel. The current release of DirectDraw also supports the ModeX resolutions of 320-by-200 and 320-by-240 at 8 bpp, but these modes don't constitute simple frame-buffer access, similar to DOS's. Using ModeX works only if your call to SetCooperativeLevel includes the DDSCL_ALLOWMODEX flag.

```
hResult = pDirectDraw
->SetDisplayMode(640, 480, 8);
```

You can return the display mode to its original state by calling RestoreDisplayMode, or it will be restored automatically when the DirectDraw object is released.

The next step is to create a primary DirectDrawSurface object, which represents either a display surface or an off-screen buffer and resides in either system or video memory. Its member functions allow the copying of data from one surface to another, page flipping, and much more. DirectDraw surfaces are created with the DirectDraw object's member function CreateSurface:

```
DDSURFACEDESC ddSurfaceDesc;
HRESULT hResult;
surfaceDesc.dwSize =
 sizeof(DDSURFACEDESC);
surfaceDesc.dwFlags = DDSD_CAPS |
 DDSD_BACKBUFFERCOUNT;
surfaceDesc.ddsCaps.dwCaps =
 DDSCAPS_PRIMARYSURFACE |
 DDSCAPS_COMPLEX | DDSCAPS_FLIP;
surfaceDesc.dwBackBufferCount = 1;
hResult = pDirectDraw->CreateSurface
 (&surfaceDesc, &pDDSurface, NULL);
```

This code snippet creates a complex, primary surface with a front buffer, one back buffer, and flipping capabilities. A complex surface is really just a way to create more than one surface with a call to CreateSurface. The DDSCAPS_PRIMARYSURFACE flag does two things: It makes the newly created surface the displayed surface and tells DirectDraw to size the surface to the current display mode.

You can create several other types of surfaces. Other than the complex flipping surface, the most common type is a plain off-screen buffer, which can be in either system or video memory; but remember, you can use hardware acceleration only on surfaces created in video memory. Since video RAM (VRAM) is a scarce resource, you should think of your VRAM as a cache and store in it only images that will be drawn frequently. Images not stored in video memory can be stored in DirectDraw surfaces created in system memory, but you may want to store them in your own format, since DirectDraw surfaces cannot be compressed yet.

The next step is to create a DirectDrawPalette object, using the CreatePalette function. DirectDrawPalettes represent 16- or 256-index palettes that can be attached to surfaces. Typically, you would create a 256-color palette. In order to do this, you need to create an array of PALETTEENTRY structures. These are the same RGB structures you would use to create normal GDI palettes. Once you have filled the array with the 256 color triples, you pass them to the CreatePalette function:

```
PALETTEENTRY pe[256];
hResult = pDirectDraw
 ->CreatePalette(DDPCAPS_8BIT, pe,
 &pDDPalette, NULL);
```

Once you have a palette, you will want to associate it with your primary surface:

```
ddrval = pDDSSurface
 ->SetPalette(pDDPalette);
```

Now all 8-bit values in the primary surfaces will be indexed into pDDPalette for the correct RGB values.

PUTTING DIRECTDRAW TO USE

Now that we've set up all the essential components of a DirectDraw application, let's discuss some of the functions and techniques likely to be needed in common-use scenarios.

Copying (or blitting) data from one surface to another is probably DirectDraw's most frequently used feature, so we'll take a closer look at how that works. Blitting from one surface to another is accomplished with the DirectDrawSurface member functions Blt and BltFast. These functions blit between any two system or VRAM surfaces, but remember, hardware acceleration is possible only when both source and destination surfaces are in VRAM.

For simple transparent and copy blits, the BltFast function is preferable to Blt. If you are using software emulation, BltFast is 10 percent faster than Blt; if you have hardware blitting, however, there is no speed difference. If you want to do a color fill or use some of the more esoteric blitting effects, you have to use the standard Blt function.

```
ddrval = pDestSurface->BltFast(nDestX,
 nDestY,
 pSourceSurface,
 &sourceRect,
 DDBLTFAST_SRCCOLORKEY);
```

This line copies the area defined by sourceRect from pSourceSurface to the nDestX, nDestY position in pDestSurface, using the source surface's color key for transparency. You can define a color key for any surface with the member function SetColorKey:

```
DDCOLORKEY ddck;
ddck.dwColorSpaceLowValue = 0;
ddck.dwColorSpaceHighValue = 0;
pSourceSurface
 ->SetColorKey(DDCKEY_SRCBLT,
 &ddck);
```

After this code has been executed, any time you blit from pSourceSurface to another surface and tell Blt or BltFast to use a source color key, all pixels with a value of 0 will be transparent.

Another useful type of blit is a color fill, which is accomplished with a call to the Blt function after you set the appropriate flags. The following code will fill the specified area of the destination surface with color 0.

```
DDBLTFX bltFX;
DWORD dwFlags = DDBLT_COLORFILL;
bltFX.dwSize = sizeof(DDBLTFX);
bltFX.dwFillColor = 0;
// set up fillRect
hResult = pSurface->Blt(&fillRect,
 NULL, NULL, dwFlags, &bltFX);
```

With games, you often don't want just to blit an image from one surface to another; you also want to manipulate the actual bits that

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represent the image in video memory. To do this, you need to get a pointer to the surface's memory with the surface's Lock function, which you must call with a RECT structure that contains the rectangle of the area to be locked. If you need the entire surface, the rectangle pointer should be NULL. When Lock is finished, the DDSURFACEDESC structure will contain a pointer to the surface memory in the lpSurface member. Remember to assign this to a pointer type, since it is LPVOID and has no size. Also note the DDLOCK_WAIT flag: DirectDraw could still be busy with blitting when you call Lock, which would then fail. With the wait flag, DirectDraw will wait for all blits to finish.

```
HResult hResult;
DDSURFACEDESC surfaceDesc;
hResult = pDDSurface->Lock(pDestRect,
 &surfaceDesc, DDLOCK_SURFACEMEMORYPTR
 | DDLOCK_WAIT);
BYTE* pBits = surfaceDesc.lpSurface
 // do your custom rendering here
 hResult = pDDSurface->Unlock(pBits);
```

After the Lock call, pBits will point to the target surface's actual memory, be it system or VRAM. When you are done writing to the surface, be sure to call the Unlock function. You have to be careful between Lock and Unlock calls because standard GUI debuggers cannot be used during this period.

In addition to locking a surface to do custom blitting, you can also obtain a standard Windows device context (DC) that refers to the given surface. The most useful advantage of doing this is to let GDI's TextOut function handle all of your text. Almost all modern video cards have some sort of hardware that quickly renders TrueType fonts, so this method is probably faster than the standard technique of storing a bitmap for each number or letter.

To get a DC for a surface, you call the DirectDrawSurface member function GetDC. The returned handle to a DC is a standard Windows hDC and can be used accordingly. When you are done with the hDC, you have to call ReleaseDC. Whenever a call to GetDC is made, DirectDraw makes an internal call to Lock, so the debugging restrictions between Lock and Unlock also apply between GetDC and ReleaseDC.

Whenever you are using DirectDraw, you have to be prepared to lose your surfaces. Losing a surface means that although the COM object is still in existence, the video memory that the surface used to own has been released. Surfaces can be lost for a variety of reasons, the most common being changes in the display mode, either screen resolution or color depth. That happens when the user switches to another application, since DirectDraw switches back to the original display mode when your application loses the focus.

When a surface has been lost, member functions return the error code DDERR_SURFACELOST. When you receive this error message, the first thing you have to do is to get your surface's memory back by calling the Restore member function. Restore simply reallocates the surface's memory, but you are then responsible for restoring its contents to what they were before the surface was lost. This usually means recopying the bitmaps that were in the surface before it was lost.

So far we have covered the basics of using DirectDraw in a C++ environment. In the next installment, we'll discuss how this functionality can be merged into a Win32 application using MFC. We will also discuss other topics related to using the MFC class structure and we'll create a full-screen game. ■

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By Neil J. Rubenking

Control Installations Under Windows 95

A new 32-bit version of InCtrl understands the registry and long filenames.

You just can't trust those installation programs. Sure, they'll copy a new application's essential files to the hard disk, but they'll also add files to existing directories, change .INI files, tweak the Registry, and generally litter the disk. Yes, Windows 95 includes an Add/Remove Programs applet in its Control Panel, but this applet is virtually powerless on its own. It can function only if the installation program includes an uninstall function and provides the applet with all necessary information. If the installation program is old or uncooperative, the Add/Remove Programs applet can't do a thing.

PC Magazine readers have used InCtrl 2 (and InCtrl before it) to track the system changes made by Windows 3.1 installation programs. You've consistently kept InCtrl in the "Top Ten" list of popular downloads. InCtrl2 is a 16-bit program, however, and thus not suited to tracking installations in 32-bit Windows (Windows 95 or Windows NT). It can't track the all-important 32-bit Registry, and it's unaware of long filenames. Bowing to popular demand, we've created InCtrl 3, which specifically targets 32-bit Windows.

InCtrl 3 handles long filenames, tracks changes to the Registry, and generally runs faster because it's a 32-bit program. By the same token, InCtrl 3 can be used *only* under Windows 95 or NT. In addition, its interface has been revised to add clarity and ease of use while providing more control.

You can obtain InCtrl 3 by downloading it from PC Magazine Online or by mail. (Refer to the sidebar "Guide to Our Utilities" for details.) The source code for InCtrl 3, which was written in Borland's visual programming tool Delphi, is provided for those interested in seeing how it works.

INSTALLING INCTRL 3

To install InCtrl 3, create a new directory and copy the files INCTRL3.EXE and INCTRL3.HLP to it. This directory is the default location for InCtrl 3's report files and also holds all of the temporary files. You may add INCTRL3.EXE to your Start menu, if you wish, or simply launch it from the Start menu's Run dialog as needed.

Being a 32-bit program itself, InCtrl 3 stores its own persistent data in the Registry. If you decide to remove it from your system, first issue the command

```
INCTRL3 CleanRegistry
```

either from a DOS box or from the Start menu's Run dialog. After doing this, you can simply delete InCtrl 3's directory and all the files it contains.

USING INCTRL 3

You don't install new programs every day. In fact, weeks may go by between installations. InCtrl 3 uses a step-by-step, wizard-style multi-page interface to save you from having to remember how to use it. The first page introduces the program, and each succeeding page asks a simple question. Buttons marked Next and Prev let you navigate back and forth among the pages. The Next button is enabled only when you have answered the current question appropriately. When you've answered all the questions, clicking on the Finish button initiates the installation.

IN THIS ISSUE

InCtrl 3

InCtrl 3 lets you track system changes made by Windows 95 and Windows NT installation programs.



InCtrl 3 lets you decide just how much control you want over the installation-tracking process. Five of the question pages have a check box at the bottom labeled "Skip this page in the future." When you have checked a page's skip box, InCtrl 3 skips over that page each succeeding time you run it, reusing whatever value you previously entered. To see all pages, including those whose skip boxes are checked, check the "Show all pages" box on the first page. By arranging to skip pages whose answers rarely change, you can simplify the process of using InCtrl 3. And the show-all-pages option provides a safety net in case you change your mind about skipping a particular page.

Most of the on-screen elements have Windows 95–style pop-up help. To invoke pop-up help for a particular component, either click on it after clicking the question-mark icon on the title bar or right-click on it and select "What's This?" from the menu. Figure 1 shows the first question page, on which you specify which installation program you want to launch. The pop-up help for the Next button is displayed.

If you leave the installation program name blank, InCtrl 3 will operate in two-phase mode. In this mode, InCtrl 3 terminates after collecting information about the system. You perform the installation, then run InCtrl 3 again to get a report on system changes. You can use this mode to take advantage of the Windows 95 Add/Remove Programs applet without risk. If the installation program cooperates, you can use the same applet to remove it. If not, you still have the InCtrl 3 report handy. And of course, if a particular installation program proves to be incompatible with InCtrl 3, you can use two-phase mode to avoid a conflict.

In most cases, however, you'll enter the installation program's name in the upper edit box or click on the Browse button to select it from a standard file dialog box. When you've entered the name of an existing executable file, the Next button will become enabled. Note that for InCtrl 3's purposes, the .INF files used by some programs for installation are considered to be executable. In the rare event that the installation program requires command-line switches, you can enter those in the lower edit box.

The next page asks for a descriptive name, which will be included in the report file that InCtrl 3 generates. Don't skip this step! You may find yourself examining the report many months later, so the more thorough your description, the better.

On the following page, InCtrl 3 offers a unique numeric filename for the report (see Figure 2). You can either accept this filename or click on the Select button to choose another name. The Next button will be disabled if you choose a file that's not on a hard disk or

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network drive. If you're satisfied with InCtrl 3's numeric filenames, you can suppress this page in the future by checking the skip box. Again, if you need to regain access to a skipped page, you can always select the show-all-pages option on the first page.

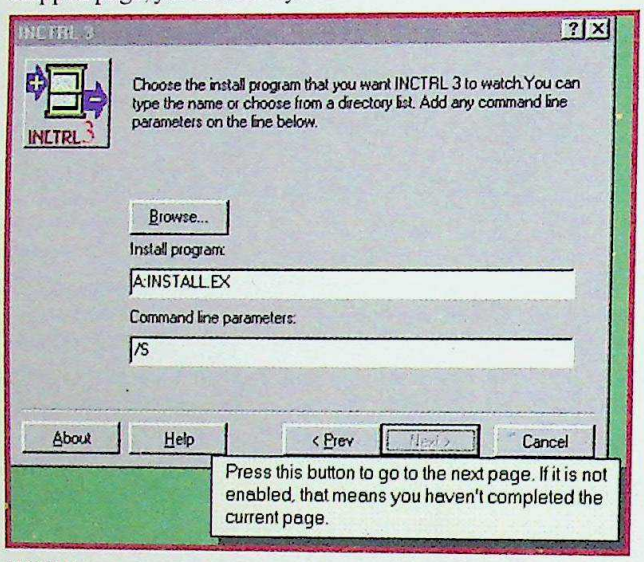


FIGURE 1: *InCtrl 3 asks a series of questions about the installation process; most on-screen elements have pop-up help.*

Now you must decide whether to track files by examining the target disk's file structure before and after the installation and noting the differences (disk-contents comparison) or by simply checking for files with date/time stamps after the start of the installation (file-time comparison). Disk-contents comparison is the default. It's the slower of the two methods and requires an appreciable amount of temporary disk space to record the file layouts before and after the installation, but it dependably reports on files and directories added to or deleted from the system as well as on files whose sizes or date/time stamps have changed.

The file-time-comparison method doesn't store any information about the target disk's file structure. It simply looks for files whose creation time or last-write time is after the start of the installation. This would not work in 16-bit Windows, where copying a file doesn't change its DOS date/time stamp. But 32-bit Windows maintains the creation and last-write times separately, and copying a file does update its last-write time.

File-time comparison is inherently not as reliable as disk-contents comparison. It can't distinguish new files from changed ones, and if the system clock is set incorrectly or any files have erroneous dates, it can produce incorrect results. Use this method only if you're short on disk space or very short on time. If you'll always want to use the tracking method you've selected, check the skip box on this page.

Longtime fans of InCtrl will miss the super-speedy Fast File Notification tracking mode, in which an undocumented function coerces Windows itself into notifying InCtrl of every change to the file system. InCtrl 3 can't offer Fast File Notification because this undocumented function is no longer present in Windows 95 and doesn't work on NTFS drives under Windows NT.

The next page lets you avoid tracking drives and directories that you know won't be changed by the installation. The scrolling list includes a button and two labels for each drive. On each button is an icon representing the type of storage medium: hard disk, removable disk, network drive, CD-ROM, or RAM disk. Installing onto a CD-ROM drive or RAM disk makes no sense, so buttons for these types are disabled. To the right of each button is one of three words: YES, NO, or DIR>. YES means the entire drive will be tracked, and NO means the drive will not be tracked at all. DIR> means that files in a selected directory and its subdirectories will be tracked, and the directory name appears just after the DIR> label.

Initially, removable disks are set to NO and hard disks and network drives to YES. Clicking on a button causes it to cycle through the three possibilities: DIR> becomes NO, NO becomes YES, and YES becomes DIR>. When you click on a button for a drive set to YES, a pop-up window appears that lets you choose the directory (see Figure 3). Suppose you're installing to drive D: and Windows resides in C:\WINDOWS. You'd set drive C: to track just the C:\WINDOWS directory, set drive D: to YES, and set any other drives to NO. If you have only one disk drive, or if you'll always want to track the same set of drives and directories, you can check the skip box on this page after you've made your choices.

The next page lists .INI files that InCtrl 3 will track. This list initially contains WIN.INI and SYSTEM.INI. Windows 95 still uses these files, although many of their functions have been transferred to the Registry. You can delete one or both of them or add other .INI files to the list. And of course, if you anticipate tracking the same set of .INI files for each installation, you can check the skip box on this page when you've adjusted the list to your satisfaction.

The next page is skipped by default—it won't show up unless you've checked the "Show all pages" box. It lists, in read-only form, the Registry keys that InCtrl 3 ignores. These are keys whose data changes without program intervention. If a change occurs while InCtrl 3 is running an installation program, it would be reported as a change caused by the installation program. Even so, background programs on your system may make changes to the Registry while InCtrl 3 is running, and those changes will show up in the report as well. There's nothing we can do about that.

That's it. You're ready! The final page shows the choices you've made and a Finish button that has taken the place of the Next button. Look closely at the reported choices; if any is incorrect, you can go back (using the Prev button) and correct it. When everything is ready, click on Finish. InCtrl 3 will shrink to a small always-on-top window and begin recording preinstallation system data. Just so you know it's not idle, it keeps the small window updated with a report of what it's doing. If for some reason you decide not to go through with the installation, click on the Abort: Install button. Once the installation program has been launched, however, it can't be launched, so at that point this button changes to Abort: No Report.

Now the installation program is in charge. Follow its instructions, answer its questions, and feed it disks, if necessary. When the installation program ends, InCtrl 3 will beep and present the message "Install may complete." This means that the installation program launched by InCtrl 3 has terminated. But since that program may have launched a secondary installation program, InCtrl 3 can't be sure the entire process is done. You, the user, are the final arbiter. When you see that the installation is complete, click on the Install Done: Report button. InCtrl 3 will gather its post-install system information, generate a report of changes, and preview the report on the screen. The report file is a plain-text file that you can view or edit at any time.

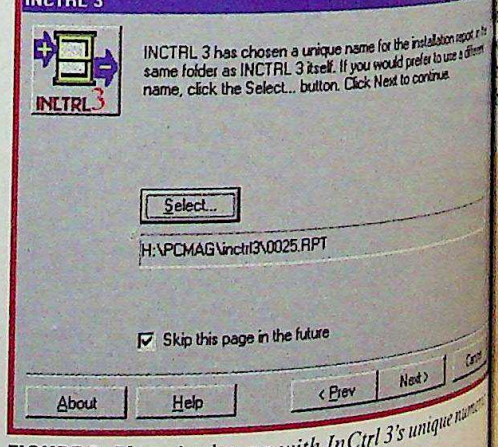


FIGURE 2: *If you're happy with InCtrl 3's unique filenames, you can choose to skip this page.*

If the installation program restarts Windows, perhaps to activate a new driver, it won't stop InCtrl 3. When Windows restarts and

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...Ctrl 3 restarts as well. As soon as the installation is complete, just ask for your report. Or, as you selected previously, you can omit the installation program name to run in two-phase mode. If you do, InCtrl 3 will terminate after gathering the preinstallation information, which will allow you to run the installation program with a trace of InCtrl 3 in memory. When the installation is complete, run InCtrl 3 again to permit the postinstallation information gathering and comparison.

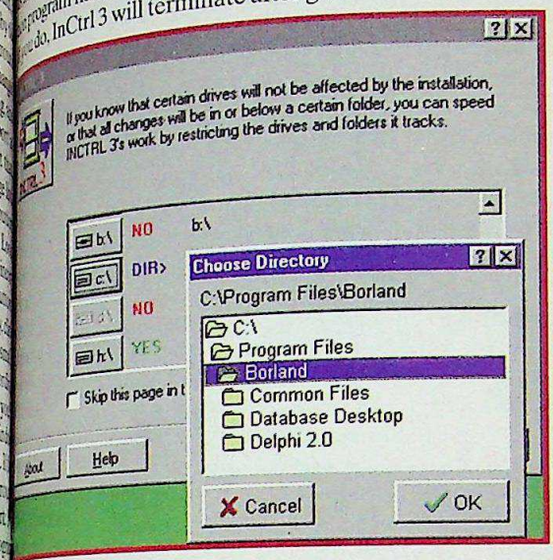


FIGURE 3: *By carefully controlling which drives are tracked, you can speed up InCtrl 3's recording of the file system.*

INSTALLING PROGRAMS

InCtrl 3 does not presume to replace utilities such as CleanSweep, Remove-It, or UnInstaller 3. It simply provides you with the information needed to handle removing programs yourself. Be cautious in your use of the InCtrl report! Don't wildly attempt to delete all added files, restore all changed Registry keys, or remove all added .INI file data. It's quite possible that another program installed after the one you're removing relies on some of those system elements.

If you used the disk-contents-comparison tracking method, the report lists added and deleted files and directories along with changed files. You can't bring back deleted items or restore changed files, but you can delete files and directories that have been added. If the installation program adds a whole directory, it's almost always safe to delete all the files it adds within that directory. Any remaining files may be data you have created using the program; don't delete these without examining them. Files added to an existing directory, such as the Windows or System directories, can't necessarily be deleted with impunity. Other programs installed later may rely on them, but since the files were already in place, the other programs' installation reports won't show them. Rather than deleting these files, rename them, or move them to a "holding" directory. After you have determined that your other programs still run correctly, you can archive the files to floppy disks or delete them.

Similar advice applies to .INI files and Registry keys. If a program adds its own .INI file, its own section to an existing .INI file, or a new branch to the Registry, you can normally delete the entire file, section, or branch. If it adds keys to an existing .INI file section or to the Registry, it's possible that other programs are relying on those keys. To be safe, don't delete them. Comment out .INI file keys by adding semicolons at the start of the appropriate lines. You can't literally comment out a Registry key or value, but if you rename it to begin with a semicolon, you'll effectively remove it from circulation. And if an .INI key's value or Registry value's data was changed, don't just change it back. For .INI keys, make a duplicate of the line, comment out the original, and change the duplicate. For Registry keys, create a new key with the same value(s), rename the original, and change the duplicate. As before, check to make sure your other programs work before making your changes permanent.

PROGRAMMING INCTRL 3

The most essential change from InCtrl 2 to InCtrl 3 was the move from 16-bit to 32-bit programming. Direct effects of this move include the ability to track the 32-bit Windows Registry, support for long filenames, and faster execution. The enhanced functions in Delphi 2.0 and the 32-bit Windows API also allowed some streamlining of code. For example, Delphi 2.0 adds a Trim function that trims any number of spaces or control characters from the start and end of a string, replacing a dozen lines of Delphi 1.0 code. InCtrl 3's .INI file processing was vastly simplified by the new ability of the GetPrivateProfileStrings function to return a list of all sections in the .INI file. And whereas InCtrl 2 went to great lengths to categorize the installation program (32-bit Windows .EXE, 16-bit Windows .EXE, DOS .EXE, and so on), InCtrl 3 gets that same information with a 32-bit Windows API call.

TRACKING LONG FILENAMES

To determine what files and directories have been added, deleted, or changed, InCtrl 3 records each specified drive's or directory's file structure. For this purpose it uses a standard recursive function that uses the FindFirst and FindNext commands to fill a variable of type TSearchRec repeatedly with file information. Modifying this function to use long filenames was a snap, as the Delphi 2.0 TSearchRec structure includes the long filename.

The biggest difficulty in moving to long filenames involved finding code that made assumptions about the length of filenames. For example, InCtrl 2 could safely allocate pre-

```
unit pathdu;
interface
uses Windows, Classes;
type
  TProcDoneThread = class(TThread)
    ProcHandle : THandle;
    Constructor Create(vProcHandle: THandle; OnTerm: TNotifyEvent);
    procedure Execute; override;
  end;

implementation

constructor TProcDoneThread.Create(vProcHandle: THandle;
  OnTerm: TNotifyEvent);
begin
  Inherited Create(False);
  ProcHandle     := vProcHandle;
  OnTerminate    := OnTerm;
  FreeOnTerminate := True;
end;

procedure TProcDoneThread.execute;
begin
  WaitForSingleObject(ProcHandle, INFINITE);
  CloseHandle(ProcHandle);
end;

end.
```

FIGURE 4: *Like every TThread descendant, this object has an Execute method that defines what it does.*

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cisely 11 characters to store each filename: 8 for the name and 3 for the extension. InCtrl 3 has to use a different layout because filenames can have up to 255 characters.

The first character of each line in the output file is a number indicating the subdirectory level. The starting directory, which may or may not be the root directory, has a level character of 0, its subdirectories have level 1, and so on. The next four characters are derived by mathematically combining the date/time stamp of the file and its size and converting the result into a printable string. InCtrl 3 calculates this four-character string before and after the installation program runs. If the two strings are not the same, the file was changed during the installation process. The remainder of each line is the filename itself.

Every long filename has a unique short filename, so you might think InCtrl 3 could save space by storing only the short filenames. However, if it did so there would be no way to report the long filename of a deleted file. The only way to get from a short filename to the corresponding long filename is to pass the short name to the FindFirst function and check the long filename of the result. That won't work if the file is no longer present.

A 16-bit program that calls FindFirst gets back a single date/time stamp in its TSearchRec. A 32-bit program gets three additional date/time stamps, representing the file's creation time, the last time the file was modified, and the last time the file was accessed. When InCtrl 3 is running in file-time-comparison mode, it finds new and changed files by looking for files having a valid (nonzero) creation or last-write time that is after the beginning of the installation process. Another recursive function walks the directory structure of the selected drives and directories, adding all such files to the output report.

THE REGISTRY

A 32-bit Windows program stores persistent data in the Registry rather than in private .INI files. Delphi 2.0's TRegistry object defines methods to handle every Registry manipulation task. Its descendant object TRegIniFile adds to these a set of methods that precisely correspond to the methods of TIniFile. TIniFile handles access to an .INI file; TRegIniFile handles access to a branch of the Registry as if it were an .INI file. This fact makes it simple to write code that will store persistent data when compiled under either Delphi 1.0 or Delphi 2.0. For example:

```
{$IFDEF Win32}
WITH TRegIniFile.Create('Software\PCM
\MyProg\1.0') DO
{$ELSE}
WITH TIniFile.Create('MYPROG.INI') DO
{$ENDIF}
try
  S := ReadString('Section', 'Key',
                  'Default Value');
finally
 free;
end;
```

InCtrl 3 uses both the TRegistry object and the TRegIniFile object.

Each Registry key can contain one or more values and one or more subkeys, so the structure is similar to that of a directory tree. It's no surprise, then, that the Registry data is stored in roughly the same way as the file-structure data. Each line of an InCtrl 3 Registry data file starts with a character indicating the item's depth in the hierarchy. The next character reflects the item's type: 0 for a key name, 1 for a key value, and 2 or greater for key value data. The remainder of the line holds the key name, value name, or value data.

THE TOP 10 UTILITIES

1. **CHECKE** Windows checkers game
2. **SCINVO** Invokes screensaver
3. **PICALB** Organizes image files
4. **FDDLLS** Finds dead DLLs
5. **WINBAR** Taskbar for Windows 3.1
6. **SPAD** Enhanced Windows notepad
7. **WSWIN** Enhanced search tool
8. **1MBFORT** Fortifies low memory
9. **APPOIN** Windows appointment book
10. **INCTRL2** Controls Windows installs

The RegEdit accessory can save a branch of the Registry to a text file, but these files are much larger than necessary. InCtrl 3's level-based storage system avoids redundantly storing a key's name in each of its subkeys. To save space further, InCtrl 3 stores no more than 16 bytes of a binary value. If the value contains more than 16 bytes, the remaining bytes are XORed into the first 16. The result is a set of 16 bytes that will almost certainly be different if any part of the binary data has been changed.

While a disk has just one root directory. the Registry in Windows 95 has six "root keys." It's not necessary, however, for InCtrl 3 to track all six. The HKEY_CURRENT_USER root key is actually a branch of HKEY_USERS, and both HKEY_CURRENT_CONFIG and HKEY_CLASSES_ROOT are branches of HKEY_LOCAL_MACHINE. HKEY_DYN_DATA contains dynamic data that doesn't need to be tracked. So by storing HKEY_USERS and HKEY_LOCAL_MACHINE, InCtrl 3 gets all the necessary information. A [illegible] relationship holds among the root keys of the Windows NT Registry.

InCtrl 3 stores its own persistent data in the Registry key HKEY_CURRENT_USER\Software\PC Magazine\InCtrl\3.0. That's how it remembers which skip boxes you've checked, for example, and which tracking mode you chose the last time you ran the program. More importantly, InCtrl 3 relies on the Registry to help it restart if an installation program restarts Windows. If a WM_ENDSESSION message occurs while InCtrl 3 is tracking an installation, InCtrl 3 adds its own executable name as the data for a value of the predefined RunOnce key, which resides in the Registry key that represents the current Windows version. InCtrl 3 stores this key's name in a variable called CurVerKey. Under Windows 95 this is HKEY_CURRENT_USER\SOFTWARE\Microsoft\Windows\CurrentVersion; under Windows NT, it is HKEY_CURRENT_USER\SOFTWARE\Microsoft\Windows NT\CurrentVersion. In either case, when Windows restarts it runs all programs listed under the RunOnce key and then removes them from the list. These few lines of code cause InCtrl 3 to rise from the dead:

```
WITH TRegIniFile.Create(CurVerKey) DO
try
 WriteString('RunOnce', 'InCtrl 3',
             Application.ExeName);
finally
 Free;
end;
```

InCtrl 3's about box also picks up handy information from the Registry. The registered owner and registered company name are stored as values in CurVerKey. Under Windows 95, the CD-ROM ID number is also stored there. And determining whether a math coprocessor is present involves checking a key under HKEY_LOCAL_MACHINE.

PROCESSES AND THREADS

When the installation program terminates, InCtrl 3 announces that fact by displaying a message "Installation may be complete." This is done by use of a thread that waits silently in the background until the installation program terminates, then triggers an event back in the main program.

A 32-bit program can nominally launch another program using WinExec, ShellExecute, or the modern CreateProcess. In 32-bit Windows, however, WinExec and ShellExecute are nothing more than wrappers around CreateProcess, and they hide much of the useful information returned by CreateProcess. For this reason, 32-bit programs should always call CreateProcess directly to launch other programs. If the CreateProcess call in the [illegible] Install method succeeds, the TProcessInfo

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...structure's hProcess and hThread fields ...ain the new process's handle and the han... ...of its main thread. ExecInstall closes the ...Thread right away, since it isn't needed, and ...sses the handle and the ThdProcDone event ...dler to the constructor for the TProcDone... ...Thread object. Figure 4 is the entire source code ...r TProcDoneThread. you'll surely find a use ...r this object in your own programs.

Delphi's TThread object is an abstract type; ...u never create an instance of TThread. Rather, you define a TThread descendant ...hose Create constructor performs any extra ...tialization and whose Execute method per... ...rms the desired action. This particular object's constructor passes False to the inherited constructor, meaning that the thread should be created in an active rather than suspended state. It stores the passed process handle in the private data field ProcHandle, sets its OnTerminate property to the event handler supplied by the calling process, and sets its FreeOnTerminate property to True.

The WaitForSingleObject API function's behavior depends on the type of handle it is passed. The Execute method passes a process handle, so the function waits until the process terminates. At that time, the Execute method closes the process handle it was using. Because the thread's FreeOnTerminate property is True, the thread object is released from memory as well. The OnTerminate event handler back in the main program is triggered, indicating that the process has ended.

InCtrl has grown quite a bit since its debut in 1993. By keeping up with changes in the underlying Windows platform, it retains its usefulness, and the changes required in the programming make for an interesting discussion. Perhaps the next version of Windows will have its own installation tracking built in. If not, InCtrl will be there to help! □

Neil J. Rubenking is technical editor of PC Magazine.

GUIDE TO OUR UTILITIES

ABOUT INCTRL 3...

DESCRIPTION InCtrl 3 lets you track system changes made by Windows 95 and Windows NT installation programs. Like InCtrl 2 for Windows 3.1, it tracks file additions and deletions as well as changes made to .INI files. In addition, it handles long filenames and tracks changes to the Registry. InCtrl3 is a 32-bit program and requires Windows 95 or Windows NT.

USAGE To install InCtrl 3, create a new directory and copy the files INCTRL3.EXE and INCTRL3.HLP to it. You may add INCTRL3.EXE to your Start menu, if you wish, or simply launch it from the Start menu's Run dialog as needed.

InCtrl 3 stores its own persistent data in the Registry. If you decide to remove it from your system, first issue the command

```
INCTRL3 CleanRegistry
```

either from a DOS box or from the Start menu's Run dialog. After doing this, you can simply delete InCtrl 3's directory and all the files it contains.

InCtrl 3 uses a wizard-style interface, so you don't have to remember how to use it between program installations. The first page introduces the program, and each succeeding page asks a simple question. Buttons marked Next and Prev let you navigate back and forth among the pages. The Next button is enabled only when the current question has been answered appropriately. When you've answered all the questions, click on the Finish button to perform the installation.

InCtrl 3 will shrink to a small, always-on-top window and begin recording preinstallation system data. Just so you'll know it's not idle, it keeps the small window updated with a report of what it's doing. If for some reason you decide not to go through with the installation, click on the Abort: No Install button. Once the install program has been launched, however, it can't be unlaunched; at that point, the button changes to Abort: No Report.

When the install program ends, InCtrl 3 will beep and present the message "Install may be complete." This means that the install program launched by InCtrl 3 has terminated. But since that program may have launched a secondary install program, InCtrl 3 can't be sure the entire process is done. You, the user, are the final arbiter. When you see that the installation is complete, press the Install Done: Report button. InCtrl 3 will gather its postinstall system information, generate a report of changes, and preview the report on the screen. The report file is a plain-text file that you can view or edit at any time.

Most of the on-screen elements have Windows 95–style pop-up help. To invoke pop-up help for a particular component, either click on it after clicking on the question-mark icon on the title bar or right-click on it and select "What's This?" from the menu.

SUPPORT Help for *PC Magazine*'s free utilities can be obtained electronically in the Utilities section of ZD Net's Tips forum (GO ZNT:TIPS). You may find an answer to your question simply by reading the messages posted in the forum. If the author is not available and the forum sysops can't answer your question, the Utilities column editor will contact the author for you.

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BUDGET PROPOSALS ON IT:

Not Much To Write Home About

Industry reactions are on predictable lines; from ecstatic support through disappointment to angry outbursts.

Annual budget proposals are a routine exercise. They invariably cause a lot of heart-burns. This is because, in essence, a budget proposal is nothing but an impossible attempt to meet uncontrollable expenditure through very limited resource mobilization. If resources were abundant and government expenditure under tight control, there would be no need to go through this tedious rigmarole.

This year's annual budget reflects the political compulsions of a coalition government that is not sure of its future. Attempts have been made to satisfy all partners in the coalition, though the overbearing impression is that Dr Manmohan Singh's bold and transparent measures aimed at globalizing the Indian economy have been consciously upheld. The motive behind this is quite obvious. The Congress, to which the honorable finance minister has always belonged, must be kept in good humor, if the coalition government is to retain its semblance of stability.

What are the implications of the budget for the IT industry? Almost all representatives who have cared to comment on the 1996-97 budget proposals have expressed reservations, though in a muted manner. Some representatives have been more forthright than others in criticizing the negative aspects.

Budget proposals do not appear from the blue. Every industry segment has its own organized bodies that function as lobbies or pressure groups. Representatives of these bodies meet decision-makers in government on a regular basis and keep them informed about their specific interests, and how these should be promoted. The more powerful and influential a body, the more clout it wields in the corridors of power. An industry segment without an organized body is like an orphan. The government invariably ignores its interests while framing budgetary proposals.

Fortunately for the IT industry, there are at least two organized bodies that act as effective pressure groups. These are the Manufacturers' Association for Information Technology (MAIT), and the National Association of Software and Service Companies (NASSCOM). There are other associations too, but their role is limited, and pertain to areas of only peripheral interest to the IT industry.

Both MAIT and NASSCOM have played stellar roles in promoting the concrete interests of the IT industry in the past. While MAIT has gradually come to represent the interests of hardware manufacturers, NASSCOM represents software companies. The two bodies do not see eye to eye on several issues, but that is a different matter altogether, and cannot be pursued here.

A significant portion of government policy on IT has been drafted in consultation with MAIT and NASSCOM. Their importance has been enhanced by the excellent performance of the IT industry in exports as well as on the domestic front. According to MAIT estimates, IT hardware exports are expected to touch Rs 59.2 billion in the year 2000, from Rs 7.75 billion in 1995-96. By the turn of the century, total IT turnover will be to the tune of Rs 278 billion compared to Rs 36 billion in 1995-96. This represents a projected eight-fold increase in a period of five years.

What is of significance is that this year, both MAIT and NASSCOM have received the budget proposals with circumspection. For once, representatives of these bodies had no inkling about the proposals. The sops they expected were not all there, and the degree of appeasement was very low.

This will be evident from the angry outbursts of Gopal Srinivasan, president, MAIT: "The budget is meant for American companies. We are very disappointed. Fundamental issues like depreciation were not addressed and the industry has not got the attention it deserved. The cuts in customs duty look good only on paper. I do not think the usage of computers will increase because of these measures. Although the announcement of the duty cut was dramatic, the move has fallen flat on its face. While imported brands will cost 15% less, indigenously assembled products will cost only 3.5% to 4% less."

Dewang Mehta, executive director, NASSCOM, looks at the budget from a different perspective (Read *Dewang Mehta's column* in this issue). He has no reason to be critical of MNCs, because quite a few Indian subsidiaries of US-based software giants (like Microsoft, Oracle, Autodesk, Novell) are members of NASSCOM, and are actually spearheading its anti-piracy drive. Mehta is mildly critical of the Minimum Alternate Tax (MAT) proposal, and believes that software exporters should be kept out of its purview: "On one hand, the finance minister did not peg down or withdraw any export incentives under Section 80 HHE of Income Tax Act, and we are thankful for... On the other, he has diluted the provision... export incentives by introducing MAT."

The reaction of other representatives... more or less between these two perspec... Atul Vijaykar, country manger, Intel In... privileged member of the MNC frat... shall we say) felt: "The reduction of ... duties is a step in the right direction. To... a knowledge worker in India paid a si... cantly higher premium for computers ... vis his counterpart in China. The reduct... duties will enable computer prices to ... down, and thereby help accelerate the g... of the Indian IT industry. A robust IT ... structure is going to be key to India's g... competitiveness."

Rajendra Pawar, vice-chairman and ... NIIT, the country's leading computer e... tion and training organization, too, prefe... diplomacy to forthright comment: "The ... get shows no roll back on reforms. It ... combined the twin goals of social justice ... economic growth. The near doubling of ... cation to primary education will go a ... way in upgrading the vast human poten... the country."

Ajai Chowdhry, president & CEO, ... HP, who is also chairman (exports c... tee), MAIT, said, "The reduction in ... duties on computers and computer peri... als will give further impetus to the gro... the IT industry in the country. However, ... budget recommendation is not very clear ... we are analyzing its implications. Additi... ally, the exim policy has not changed. T... a special import license is still required ... computers below Rs 0.15 million." The ... ment is a damp squib when compared ... Gopal Srinivasan's intemperate outburst. S... then, let us not forget that HCL HP is a ... venture between HCL, a member of the H... group, and Hewlett-Packard Company ... US!

IT-Related Proposals

- No change in excise rates. No excise duty ... software. For computers, computer peri... semblies, and peripherals, excise duty ... at 15%.
- Customs duty on computers and periph... reduced from 40% to 20%.
- Special customs duty of 2% on all ... other than items that attract nil rate of ...
- Minimum Alternate Tax (MAT) intro... for the first time on zero-tax companies ... prietary and partnership firms exempted ... MAT.
- Special attention to the development of ... scale industry.
- Promotion of science and technology th... indigenous R&D.
- Massive computerization drive at Life I... ance Corporation (LIC) and General I... ance Corporation (GIC).

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Ashok Soota, group president, Wipro Infotech, echoed Dewang's Mehta's sentiments thus: "MAT will affect software exporters adversely, unless they are granted special exemption. The software industry needs all the encouragement it can get, in view of rising costs, competition, and recessions in the US and other markets."

Ajit Chakravarti, executive VP, PCL Hindware, the recently established software development unit of PCL, played it safe by focusing on the positive aspects of the proposals: "The IT industry, especially the software sector, is likely to derive some benefit from the 1996 budget. Customs duty reduction on computer manufacture will reduce prices and encourage capital investment in software development enterprises. This is a positive step towards encouraging software exports. The additional budget allocation for science and technology, and the encouragement to R&D activities, will give a boost to the economic and industrial growth of the country. The IT industry will be a major beneficiary."

Pramod Rao, MD, Zicom Security Systems, preferred not to mince words: "For our industry, the budget was a bit of a disappointment. The duties on electronic equipment were expected to be lowered. However, the budget has given only small reliefs to the industry, which will not help much to accelerate growth."

Peter Theobald, chief executive, IT Secure, sounded less pessimistic: "The 50% cut in import duty on computers will greatly stimulate sales of hardware, and have a cascading effect on software. However, the 2% special customs duty means a 2% increase in customs duty on software. Consequently, the current customs duty on software, which is at 10%, will increase to 12%. The customs duty increase can nullify the positive impact of the cut in import duty on computers."

C.V. Anant, MD, Akshay Software Technologies, took a balanced view of the proposals: "This is a good budget. The lowering of customs duty on computers and the marginal reduction in corporate tax will certainly help the industry grow."

S.S. Sinha, president, Ashok Leyland Information Technology, also echoed Mehta's viewpoint: "The applicability of MAT to companies having export income as well, will dampen their growth. There are no specific concessions for the software industry. Reduction in customs duties will definitely improve the growth of the IT industry. There will be a definite increase in computer usage and technology inflow, and thereby, growth in the domestic software market."

Venkat Kedlaya, GM (south Asia), Motorola Information Systems Group, had a constructive approach: "The Finance minister has slapped a duty of 2% across the board on all imports. I hope that the Rs 16 billion to be collected thus, will be effectively used to improve the infrastructure of ports. The port facilities available currently are grossly inadequate. Kedlaya is of the opinion that the reduction in customs duty on computers and peripherals may not result in a significant drop in computer prices due to the weakening of the rupee.

Kedlaya is unhappy that higher depreciation rates have not been announced for investment in IT: "High obsolescence in IT means new investments are now needed to upgrade as well as to absorb the benefits of technological advances. Computers and related equipment have an average life of two years. Higher depreciation would have definitely boosted investment in IT, helping both business and industry to become competitive."

Diwakar Nigam, director, Newgen Software Technologies was ecstatic about the duty reductions: "Duty reduction on computers from 40% to 20% is great news. It will not only reduce the gray market, but will also increase the usage of high-quality computer equipment by the Indian software industry. This will enable growth in software development for the domestic as well as the export market. We are very excited."

In the telecom sector, where the previous government had introduced sea changes and made heavy investments, reactions were mixed. T. Ramachandran, deputy CEO, Essar Cellphone, and chairman, Indian Group of International GSM-MOU Organization (which boasts a membership of 100 countries and 200 operators) said, "The budget is a step in the right direction. The 10% reduction in the basic import duty on cellular handsets will result in a total effective customs duty of 49.5%, which is in real terms, a reduction of about 23% from the pre-budget duty of 72.5%. The duty reduction on cellular handsets will curb grey market activity, though it will not wipe out illegal trading completely." Similar sentiments were expressed by B. V. Raman, executive director (cellular subscriber group), Motorola. He felt that duties need to be reduced further: "The black market in cellular handsets is 50% in India. It should be closer to 0%."

Manoj Kohli, executive director and CEO, Escotel Mobile Communications, summed up the reaction of the telecom industry succinctly. He said, "On the whole, the proposals offer no major thrust on the infrastructure sector including the telecom industry. Some positive movement of customs duty reduction on telecom equipment, cellular handsets, and computers has been announced. However, we were expecting a higher percentage reduction on duty on telecom equipment due to its major impact on the project costs of cellular projects. There is no change in the structure of countervailing duty on telecom equipment and handsets."

—Hirendra Chatterjee

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MARKET

IT Giants to Promote Common Standards

Cisco, Compaq, Intel, and Microsoft have announced their intention of supporting an industry-standards effort that will allow administrators to use any Web browser to manage disparate systems, networks, and applications.

The industry effort is open to the entire hardware, software, OEM, and internetworking community.

The effort intends to develop a set of management standards that will integrate existing standards such as the Desktop Management Interface (DMI) for managing desktops and servers; the Simple Network Management Protocol (SNMP) for networks; and the Hypertext Transfer Protocol (HTTP) for communication over the Internet, into an open architecture that can be managed using a Web browser.

The initial participants in this industry-wide effort support this open initiative and will cooperate on developing a resulting standard. Previous industry attempts have been proprietary, and have ignored working with existing standards.

The group's intent is to develop management tools that are scalable, interoperable, and that reduce the complexity and costs of managing networks, systems and applications.

The management proposal provides standards for managing networks, systems, and applications using Web technology. Structured and unstructured information can be presented in a variety of forms. Additionally, the proposed management standard promotes the use of three new management-related technologies, recently outlined at a meeting of the Internet Engineering Task Force (IETF). These are the HyperMedia Management Protocol (HMMP), the HyperMedia Management Schema (HMMS), and the HyperMedia Object Manager (HMOM).

HP Acquires DP-TEK

Hewlett-Packard Company announced that it has acquired certain assets of DP-TEK Development Company, an imaging technology company based in Wichita, Kan. The asset acquisition of DP-TEK's digital print-resolution-enhancement technologies and patents is expected to offer advancements to the HP LaserJet printer family.

HP and DP-TEK have worked together for more than a year to finalize the acquisition, which strengthens collaboration and facilitates development of new technologies and products. Financial terms of the deal were not disclosed.

"We want to create the best possible next generation of enhanced-print-quality products, and we can do that by combining DP-TEK's and HP's complementary imaging technologies. With the enhancements we can envision through this combination, HP will continue to bring leading print technology to our customers," says Carolyn M. Ticknor, VP and GM (laserJet solutions group), HP.

DP-TEK develops and licenses digital print-resolution-enhancement and interface technologies for the imaging industry. The company's products, which include Trueres, PhotoTone and RAMSaver, are focused on providing improved performance and print quality in computer printer applications.

"Image quality is a significant factor for most customers. HP offers DP-TEK the opportunity to develop and deliver the enhanced image quality customers want," adds Allen Frazier, president, DP-TEK,

Under the agreement, some of DP-TEK's employees will relocate to HP sites. DP-TEK has offered severance packages to its remaining employees.

Digital Enhances Notebook Ranges

Bangalore-based Digital India, a wholly-owned subsidiary of Digital Equipment Corporation of the US, has announced enhancements in the HiNote VP and HiNote Ultra II Pentium notebook families.

Says Kapil Jain, VP (PC business unit), Digital India, "We are acting quickly and aggressively to maintain our competitive edge in the market for mobile PC solutions. Following the introduction of HiNote VP and HiNote Ultra II lines earlier this year, the enhancements reinforce our mission to quickly respond to customer needs for maximum value in price/performance, and deliver enhanced features and capabilities at competitive prices."

The new high-end model in the HiNote Ultra II line, the LTS5133, includes a 11.3" SVGA color display and a 133 MHz Pentium processor. It creates a fully integrated multimedia notebook with speaker stereo sound and a 6X-speed CD-ROM drive—all in a package that is significantly smaller than many non-multimedia notebooks in the market.

The Digital HiNote VP family, a modular line of entry-level notebooks, deliver industry-leading performance and high-end features at value prices. The network-ready design of the HiNote VP integrates DMI support with Digital ClientWORKS software, a powerful combination of preloaded client management and networking utilities that help network administrators get the most out of their networking environments. The HiNote VP is easily connected to the enterprise network with a port replicator option featuring an Ethernet network interface.

Digital India markets and services the full range of Digital products in India. Its products range from high-end AlphaServer stations and servers to the Intel-based PC range. The company is the technology provider to VSNL for GIAS, providing turnkey solutions for countrywide Internet access based on Digital's AlphaServer, software, and networking solutions.

ASC Audio Video Bag Contract

US-based ASC Audio Video Corporation has announced that Cosgrove Meurer has purchased six VR-1 non-linear editing systems, all of which will be used to cut their long running television series *Unsolved Mysteries*.

"The minimal training required, especially compared to other popular non-linear editing systems, was one of the primary reasons we selected ASC's NLE." said Bob Doyle, post coordinator, Cosgrove/Meurer.

ASC Audio Video Corporation is a leading provider of integrated digital solutions to the broadcasting and post-production communities. ASC's product line includes automation controllers, non-linear editing systems, commercial insertion and network delay software, as well as networking, server, and storage technologies for broadcast and post-production applications. ASC Audio Video Corporation, USA, is represented in India by Madras-based Benchmark Microsystems.

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Escotel to Launch Cellular Phone Services

Escotel Mobile Communications, a joint venture between Escorts, the flagship company of the Rs 30 billion Escorts group, and the US $ 5.2 billion First Pacific Company, Hong Kong, has announced that it will launch its cellular phone services in October this year. Escotel has been awarded licences to operate cellular services in the Haryana, Kerala, and Uttar Pradesh (West) circles.



Nanda (left) with Thomas Y. Yasuda.

Says Rajan Nanda, chairman, Escorts group, "By providing better telecommunications, we will promote better business and achieve higher growth rates in the liberalized Indian economy. Our goal is to achieve market leadership through the high quality of our cellular network; rapid market creation through customer education and research, and by providing specific communication packages to various user groups; and good customer care and support.

Escotel will create a brand new market for cellular telephony in its circles, which have a combined population of over 1 billion.

Thomas Y. Yasuda, executive director, First Pacific Company Hong Kong, said, "First Pacific has rich experience in providing customer satisfaction to cellular subscribers in markets as modern and demanding as Hong Kong and as fast-growing as the Philippines. We expect our international expertise to be harnessed in Escotel to provide a world-class service to our Indian customers."

Lucent Technologies of the US, formerly AT&T's systems and technology business, was awarded the contract by Escotel earlier this year to build the GSM cellular telephone networks in the three circles given to Escotel. Under the contract, Lucent Technologies will also install a backbone of microwave communications in all three circles. Work on the project is going on as per schedule. Escotel plans to make an investment of nearly Rs 14 billion in the first four years of operation, which will go up to Rs 35 billion within 10 years.

Deskpro Brandname For Compaq PCs

Bangalore-based Compaq Computer Asia, a subsidiary of Compaq Computer Corporation of the US, has reorganized its commercial desktop PC products under the new brandname 'Deskpro'. The products being offered in the Deskpro line include the Deskpro 2000, Deskpro 4000, and Deskpro 6000 ranges. All the three families incorporate Intelligent Manageability features. They target the small, medium, and large business enterprises.

According to Compaq officials, the Deskpro line is the first to benefit from the company's re-engineering efforts that enable the company to maximize its cost-saving product design. The decision to bring all desktop products under a common brandname reflects Compaq's eagerness to simplify choices and ease the decision-making process, while still addressing a broad range of business needs.

Says Abhishek Mukherjee, country manager (India), Compaq Computer Asia, "Compaq today raises the bar on the level of manageability, functionality, and value that can be achieved with desktop PCs for business computing. The feature-rich desktop PCs, with the industry's most innovative tools for managing them, will appeal to the specific needs and demands of a wide range of business customers."

Compaq added Intelligent Manageability to its entry level Deskpro 2000 line and announced new desktop manageability features to the Deskpro 4000 and Deskpro 6000 models including a unique Smart Cover Sensor on the hood of the PC that alerts users and systems administrators of unauthorized access. The entire product line also has enhanced levels of serviceability that enables major components of the PC to be removed and replaced within five minutes.

According to Compaq officials, the common branding of all desktop PC products should yield better results, as customers will have a selection within the framework of their requirements.

Autodesk Contract for Neil Automation

Pune-based Neil Automation Technology, an authorized distributor of Autodesk products in India, has bagged a prestigious assignment from Autodesk for providing software quality assurance services. Says Nilanjan Bhattacharya, project manager (services), Neil Automation Technology, "Our background, experience, and familiarity with QA tools and procedures were instrumental in helping us bag this contract. This is just the beginning." Neil Automation is a CAD/CAM/CAE company, and a leading provider of desktop automation solutions.

Boca Research in JV With PowerTel Boca

Boca Research of the US has signed a strategic partnership agreement with Bangalore-based PowerTel Boca. According to the terms and conditions of the agreement, PowerTel Boca will be the exclusive arm of Boca Research in India and South Asia, and will also operate in some territories of the Middle East and Africa.

The company has a paid up capital of Rs 28 million. It will address the Rs 5 billion market for multimedia, Internet, and PC connectivity.

Says Charles Kenmore, VP and GM (international), Boca Research, "The opportunities opened up by the Internet and networking in India are immense. That is the prime reason for our investment in India."

Adds Dinesh Puri, MD, PowerTel Boca, "PowerTel Boca has the advantage of being the "first mover" in the PC add-on industry, which is poised for take-off in India."

Boca Research has international operations and ventures worldwide. The company designs, manufactures, markets, and supports quality data communications, multimedia, and networking products.

PowerTel Boca is backed by the venture funds of US-based Draper International.

PowerTel Boca items include data communications (fax, data, voice modems) and multimedia (video, telephony, sound, voice, and data) products.

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Changes in Silverline Division

Software Product Division (SPD), a division of Silverline, has decided to realign its domestic business operations in order to expand its reach within the country. SPD started its domestic operations as the national distributor for the Informix RDBMS. Subsequently, Silverline signed up with CSA Research, Singapore, to market its GUI-based CASE tool, SilverRun. Currently, Silverline operates from its corporate offices in Mumbai, and regional offices in Delhi, Madras, and Bangalore.

As an Informix value-added partner (VAP), Silverline has been consistently outgrowing the expectations of the industry with regards to providing support for and making Informix database technology available to the Indian user. SPD has restructured its regional business operations. All regional offices will henceforth operate as strategic business units, and will be headed by regional business managers. The states have been divided vertically into 4 regions. The Mumbai office will take care of western India, which includes Maharashtra, Gujarat, Goa, and parts of Madhya Pradesh. The Madras regional office will represent Tamil Nadu, Kerala, Karnataka, and Andhra Pradesh. The Delhi office will cater to the requirements of the northern territory including Punjab, Chandigarh, and Rajasthan. Currently, eastern India is handled by the head office, but Silverline will have its own office in Calcutta soon. Offices will be set up in Hyderabad, Nagpur, and certain other mini metros.

SPD will also have channel managers at each of the four mentioned regions. The channel mangers will be involved in developing business relationships with Silverline partners. Silverline's new multi-pronged strategy involves appointing dealers, value-added resellers, system Integrators, and consultants.

Roadmap for ManageWise

Novell has announced a roadmap for the future of its ManageWise PC LAN management solution. Over the next year, ManageWise will become platform-independent through support of Java technology and the Internet infrastructure. These enhanced products will enable network administrators to perform management tasks from any intranet and Internet location through World Wide Web-based management consoles. In addition, ManageWise will provide increased scalability through integrated support for Novell directory Services (NDS), Novell's industry-standard global directory services. NDS support will allow users to consolidate management information for easier site-level administration and reporting. These enhancements, slated for the first half of 1997, are part of Novell's commitment to provide customers with management services that can be distributed across any platform on private and public networks.

"Novell will continue its investment in cross-platform network services. Through NDS capabilities and Java enhancements, ManageWise will be clearly positioned to take advantage of the Internet and provide IS administrators with next-generation cross-platform management services," says Steve Markman, executive VP and GM (products group), Novell.

"ManageWise is already accepted as the first integrated management solution for PC LAN networks," adds Prem Uppaluru, VP and GM (management products division), Novell.

Future versions of the ManageWise solutions will be based on Java technology that will simplify PC LAN management by enabling network administrators to quickly and easily connect to network information through any desktop Web browser. ManageWise applications performing management tasks, including those of traffic monitoring and real-time server statistics gathering, will be written in Java and stored as applets so that users will be able to access them from any server. These platform-independent tools will not only improve the efficiency of in-house network administration, but will also enable service providers to remotely manage networks over secure Internet services such as those run by Novell's NetWare Connect Services (NCS) partners.

Future Java-based versions of ManageWise will significantly speed up the collection of and access to cross-platform network information by providing integrated support for NDS. As a common framework unifying access to NetWare, Unix, and Windows NT servers, NDS will serve as a central business object repository for all network resources and de... ManageWise will populate this data ... with hardware and software inventory ... well as topology information. The ... the Java-based infrastructure, ma... users will be able to access this infor... tion and related fault conditions thro... any management console regardless ... platform.

Oracle Registers 42% Growth Rate

Oracle Corporation has announced ... nual revenue growth of 42% for ... year ending 31st May 1996. W... total revenue of $ 4.2 billion, Oracle C... poration's database revenue continue... registers a strong demand and grew ... 49%. This was complemented by the st... market acceptance of Oracle's SmartC... suite of Oracle applications, with app... tion licenses registering a 73% grow...

Oracle's Indian operation conti... its strong revenue growth, registering ... excess of 88% for the just-concluded f... year. The strong market acceptanc... Oracle applications was reflected in ... nificant deals signed during the ... year. The companies include Kirl... Oil Engines, AP Rayons, Punj Ll... Sriram Synthetics and Chemi... Cheminor Drugs, GE Plastics, and ... Universal. Revenue of Oracle's serv... business covering the areas of tech... support, consultancy, and education ... tinued its growth with major deals ... TELCO and UTI. A number of bus... alliances were signed during the ... year to expand the prominent presen... Oracle products and services in Indi...

"Having exceeded Indian soft... industry growth by over 100% for the ... three years, and having set internati... standards for the provision of soft... support, we are now a leadership b... mark for the IT industry. We have ... strongest infrastructure and nation... presence among international soft... and services organizations in India. ... sides, the company has made signific... R&D investment through the India ... velopment Centre," says Anil Kaul, C... Oracle Software India.

Oracle Corporation is a leading ... plier of software for information ma... ment. The company offers its produ... and related consulting, education ... support services, in 90 countries.

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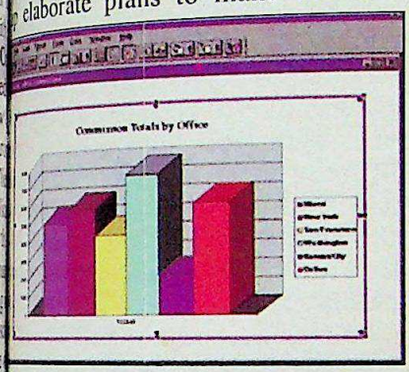
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IIT Launches PowerBuilder 5.0

IIT & Powersoft Corporation have announced the availability of PowerBuilder 5.0 and other hot technology products to address the fast growing global Internet applications market.

In addition to PowerBuilder 5.0, products that were announced as part of the launch included Optima ++, SQL Anywhere, and S Designor database modeling tool.

NIIT is the principal distributor of Powersoft products in India. It has drawn up elaborate plans to make the new



Powersoft offerings available in the country through its dedicated network of offices and support centres.

"With emphasis put on support, we have built skilled expertise to effectively bring the benefits of Powersoft's next-generation products to organizations in India. These tools for client/server and Internet applications will equip Indian organizations to meet the growing demand for robust, high-performance applications," says O.R.S. Rao, senior VP, NIIT.

Available for Windows 3.1, Windows 95, and Windows NT environments, PowerBuilder 5.0 boasts of next-generation client/server features like machine-compiled 32-bit code for fast script execution, practical application partitioning of PowerBuilder objects for improved application performance and management, full 32-bit Windows 95 logo-compliant development environment, and extended OLE 2.0 support.

PowerBuilder 5.0 will also include Object Cycle, a powerful server-based object management facility to assist team development in workgroup settings.

Optima ++ addresses the increasing demand for high-performance, component-based application development tools and enables developers to create powerful and efficient C++ applications quickly and easily, both for the client/server environment and the Internet.

It is based on the industry-leading Watcom C/C++ compiler technology, and delivers native machine code 32-bit executables. For the development and deployment of business applications on the Internet, Optima ++ will enable users to develop Internet client and server applications as well as Sun Java applets, Microsoft OLE Sweeper controls, and Netscape browser plug-ins.

Optima ++ is a part of the Sybase Web.Works portfolio of Internet products which includes products such as Web.SQL and Media Splash.

NIIT and Powersoft also introduced S-Designor 5.0 toolset for client/server modeling. The S-Designor toolset enables client/server professionals to analyze business processes and model databases for better application development.

Powersoft Corporation is a wholly-owned subsidiary of Sybase, a leader in client/server software.

NIIT is involved in software development, and computer education and training.

UB Networks in Gigabit Ethernet Alliance

Bangalore-based UB Networks has joined forces with leading networking and computer companies to form the Gigabit Ethernet Alliance (GEA), a multi-vendor effort committed to providing customers with open, cost-effective, and interoperable Gigabit (1,000 Mbps) Ethernet solutions. The alliance supports the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) protocol of the original Ethernet standard.

GEA was formalized around common objectives—to support the extension of the existing Ethernet and Fast Ethernet standards in response to industry demand for increased network bandwidth, and to address customer needs for interoperability among a series of Ethernet products which span the range of operating speeds from 10 Mbps to 1,000 Mbps.

The alliance brings together leading companies like UB Networks, 3Com Corporation, Bay Networks, Cisco Systems, Compaq Computer Corporation, and Sun Microsystems.

Gigabit Ethernet will be deployed in backbone environments as the preferred interconnection between switches which aggregate multiple lower speed (10 Mbps and 1,000 Mbps) Ethernet segments. High performance file servers will benefit from the ten-fold increase in bandwidth provided by Gigabit Ethernet. "The technology will also provide an upgrade path for bandwidth hungry application environments such as high-end imaging, prepress, and CAD/CAM, which were the first to adopt Fast Ethernet at 100 Mbps," says P.K. Prakash, marketing manager, UB Networks (India).

UB Networks is a leading global supplier of network hardware and software products, and is a pioneer in the area distributed network management solutions. The company offers a full line of enterprise-wide networking products, including the Geo family of enterprise workgroup and ATM switches, as well as comprehensive integration services.

Pentafour Brings System/21 to India

Madras-based Pentafour Software & Exports, a Rs 1 billion software company specializing in exports, has tied up with EDS of Sri Lanka to market in India the System/21 range of business software solutions for the manufacturing, financial, and distribution sectors.

System/21 has been developed by UK-based JBA International. EDS has marketing rights for the product in the Asia-Pacific region. Pentafour will market, support, maintain, and customize the product to suit Indian conditions.

System/21 is a platform-independent solution and has over 20 modules for diverse applications including finance, customer services, logistics, manufacturing, and distribution. The software has multi-lingual and multi-currency capabilities. It has a strong presence in the Asia-Pacific region. System/21is available on AS/400, HP 9000, and RS 6000, with support for RDBMS like Oracle, DB2/400, DB2/6000 on Unix, OS/400, and Windows NT.

As a business partner of Tata Information Systems (TISL), Pentafour will value-add and sell AS/400 and RS/6000 with System/21. Pentafour also has tie-ups with Alcatel, Silicon Graphics, Apple, and Synon.

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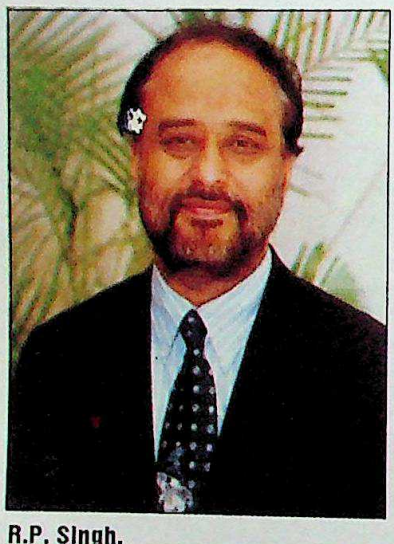
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TIE-UPS

HCL HP Is Cisco Distributor

Cisco Systems, a leading supplier of internetworking solutions, has entered into an alliance with NOIDA-based HCL Hewlett-Packard (HCL HP), for the distribution of Cisco products in India.

Cisco Systems supplies products that allow different computer networks to be seamlessly linked together across geographic locations. These products include routers, LAN and ATM switches, dial-up access servers, and network management software. Integrated by Cisco's Internetwork Operating System (Cisco IOS) software, they link geographically dispersed LANS, WANS, and IBM networks.



R.P. Singh.

Says Gary Daichendt, VP, (intercontinental operations), Cisco Systems, "We are extremely pleased with this alliance. Our synergised strengths will ensure the availability of Cisco products to a significantly wider customer base in one of the fastest growing markets in the world.

R.P. Singh, VP (marketing), HCL HP, adds, "This is a winning partnership. With Cisco's best-in-class switched internetworking products, we will be positioned better to provide world-class solutions to our customers. We are confident of substantially enhancing Cisco's market share in the country."

Commenting on the tie-up, Anil Batra, country manager, (India and SAARC region), Cisco, said, "HCL HP has a formidable distribution network across the country and Cisco will be able to leverage this strength. This augurs well for Cisco's growth in the region and will provide HCL HP with a strong partner.

HCL HP is a part of the US $ 500 million HCL group. It has 34 sales offices, 143 customer service locations, and a manufacturing facility at NOIDA.

Cisco products are distributed in India by Wipro Infotech, Microland, UB Networks, Datacraft-ICIM, and now HCL HP.

Usha Ties up with Tadiran

New Delhi-based Usha Communication (UCPL) will set up a facility at Jammu to manufacture and assemble world-class digital ISDN (Integrated Services Digital Network) customer premises equipment for the Indian market. The unit will be set up at the industrial complex at Bari Brahma, about 12 kms from Jammu, and will comply with ISO 9001 standards.

UPCL has entered into a technical collaboration with Tadiran Telecommunications of Israel to manufacture and market their world class Coral brand of Integrated Service Business Exchanges (ISBX) systems.

Says Jai Dhar Gupta, MD, UPCL, "This manufacturing and testing facility will be one the first of its kind in the country to make state-of-the-art ISBX that compare well with the best in the world. Manufacturing and assembling the ISBX systems in the country in association with Tadiran Telecommunications will give us an enormous cost advantage and enable us to tackle foreign competition in the country."

The availability of skilled labor, together with a low-dust environment, makes Jammu the ideal location for the project. Moreover, incentives such as income and sales tax exemptions for a period of five years, 30% capital subsidy, and 5% interest on working capital subsidy will help to consolidate the financial position.

"The Coral ISBX system is a fourth-generation PBX (Private Branch Exchange) that supports advanced features such as voice, data, and video networking, wireless facilities, cellular facilities, automatic call distribution, computer telephony integration, voice mail as well as ISDN and V-SAT connectivity, and computerised attendant position. Prospective customers of the system include paging companies, hotels, financial and banking institutions, courier companies, public sector undertakings, and government de-
ments. Tadiran Telecommunications is
leading manufacturer of telecommu-
tions equipment from Israel. The co-
ny manufactures equipment which
International standards for diverse
munications infrastructural needs.

Tandem to Support Warehousing Products

Tandem Computers has announced
it strongly supports MicroStrateg
new 4.0 product line. In January,
dem signed a global partnering agree-
with MicroStrategy to jointly deliver
end decision support systems (DSS)
data warehousing products and service
Fortune 1000 corporations. Tandem
ers will now interoperate
MicroStrategy's "no limits" 4.0 arc-
ture, allowing companies and indivi
to access and analyze information
data warehouses, wherever and how
needed.

Tandem supports MicroStrategy
sion of "consumerizing' the data w
house, a process by which companies
enhancing the value of their wareh
by extending them to growing audie
such as employees, strategic busines
ners, outside vendors, corporate cus
ers, and individuals. Tandem leads
industry in delivering high-perform
data warehousing solutions. Tande
approach to parallelism integrates
ware and software, making Tandem
ers particularly apt for data wareh
and decision-support applications.

Chuck Buffum, director (DSS
ness unit), Tandem, says, "The com
tion of Tandem's parallel processing
pertise and MicroStrategy's 4.0 tech
gy will enable organizations to de
their data warehouses to all consum
information." We are very excited
the possibilities inherent in the com
tion of MicroStrategy and Tandem.

Sanju K. Bansal, chief operating
er, MicroStrategy, adds, "The new
provides more decision-making pow
more users than ever before. We are
ed that Tandem can leverage our
architecture to dramatically increase
number of users who can access the
warehouse."

MicroStrategy is a leading provid
decision-support products for develop
and accessing data warehouses.

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Microland Ties up with Price Waterhouse

Bangalore-based Microland, an independent networking vendor, and Price Waterhouse Associates, a globally renowned consultancy firm, have entered into a strategic alliance that will enable the two leaders to address the needs of the Indian corporate market. A broad memorandum of understanding detailing the definitive agreement was signed during Connectivity India '96, Microland's annual international enterprise networking forum.

"In the increasingly complex and competitive market place, corporate organizations have recognized that they need to invest strategically in IT resources, so that they can acquire the key competitive advantages they seek. We believe that this alliance marks the beginning of a new era of synergistic offerings to the marketplace, resulting in increased value to corporate customers." Says Pradeep Kar, MD, Microland.

The focus of the alliance will be on the design and implementation of SAP R/3 solutions in the Indian market, based on Compaq & Windows NT. Price Waterhouse Associates, which is a world leader in SAP solution implementation and a global partner of SAP, will provide business consulting, process re-engineering skills, and implementation skills to provide business solutions built around SAP R/3.

Microland will provide its networking technology solutions and assist in the enterprise-wide roll-out and operations. Additionally, Microland will leverage its special associations as enterprise lead partner of Compaq and Microsoft, who are international partners of SAP.

"With the Indian industry rapidly joining the global mainstream and adopting contemporary business management and control systems, enterprise resource planning (ERP) has become an important area for the Indian consulting and IT communities. SAP's offerings will become increasingly relevant to the Indian market, and that is where we intend to focus." Adds Partha Bardhan, director, Price Waterhouse Associates.

"SAP is committed to advancing the state of strategic use of IT by Indian corporations through active promotion of SAP R/3, the global leader in ERP systems," says N. M. Kalambi, business development manager, SAP India. "We believe that the Price Waterhouse Associates-Microland team has complementary strengths that we expect to result in tangible gains for our SAP customers in India."

The alliance is based on two major axioms—the desire to present the marketplace with more complete and well-rounded solutions, and the need to leverage mutually complimentary skills.

STG to Offer Telecom Course

New Delhi-based Software Technology group (STG) has signed an agreement with the University of California, Berkeley, to offer a professional diploma program in Telecommunications developed in co-operation with the Department of Continuing Education in Engineering, University of California, Berkeley Extension.

University of California, Berkeley, is among the top ten universities in the world.

The program "Diploma in Telecommunications" is designed to create technical awareness of current practices and impart in-depth understanding of key elements in telecommunications engineering, including the impact of recent technology on business and organization.

The programme will be conducted on the same lines as the University of California, Berkeley. It will consist of a planned sequence of eight courses comprising 210 hours and 14 semester units. The course content includes topics of current relevance like data communication, advanced LANs, internetworking, wireless/mobile communications, and design and application of mobile data networks. The diploma will be offered by STG in all major cities as a part-time study programme catering to working executives and the corporate sector.

DEC, Samsung Join Hands

US-based Digital Equipment Corporation and Samsung Electronics Company have forged an alliance to develop and support a high volume market for products based on Digital's industry-leading 64-bit Alpha RISC architecture.

The agreement licenses Samsung as an alternate source manufacturer of current and future implementations of Digital's high-performance Alpha microprocessors. In addition, the agreement grants Samsung a license to market, sell, and distribute Alpha microprocessors worldwide. Under the agreement, Digital and Samsung will also engage in joint development projects related to the Alpha microprocessor family.

Yoon Woo Lee, President and CEO (semiconductor business), Samsung Electronics, says, "The Alpha microprocessor was chosen for Samsung's CPU business because of its many strengths including high performance, and efficient and outstanding architecture for the Windows NT operating system. We will work with Digital to build solid teamwork and partnership between the two companies. Specially through joint development programmes, both companies can develop high-performance devices that are cost-competitive. Samsung Electronics will establish the Alpha microprocessor business as one of its highly value-added businesses."

Robert D. Palmor, chairman, Digital Equipment Corporation, adds, "We are extremely pleased to create this alliance with Samsung, one of the world's leading semiconductor manufacturers. This alliance represents a significant endorsement of Digital's Alpha architecture—the foundation of Digital's global leadership in 64-bit computing. Digital has an important relationship with Samsung as a customer, partner, and supplier, and we expect this alliance to significantly strengthen the ties between the two companies."

The agreement also provides Samsung the right to distribute Digital FX132 technology, scheduled for general release later this year and give Alpha users transparent access to 32-bit Windows x86 applications on the Windows NT operating system. This will greatly augment the broad portfolio of applications available on Alpha/Windows NT systems with comparable or better performance than on x86 systems.

Samsung Electronics Company is the world's leading producer of semiconductor memory products and a $ 21 billion affiliate of the Samsung group and $ 84 billion Korea-based conglomerate. The company's total annual semiconductor sales exceeded $ 800 billion last year, and it is ranked the six largest semiconductor manufacturer.

Digital Equipment Corporation has a wholly-owned subsidiary in Bangalore.

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HOPE Appointed NetManage Distributor

US-based NetManage has appointed Hindustan Office Products (HOPE) of New Delhi as its master distributor for India. By joining hands with HOPE, NetManage is making an entry into India's emerging Internet and Intranet market.

"NetManage is the world leader in TCP/IP software. HOPE will work with it in market development, distribution, and support," says Amit Dutta Gupta, chairman and CEO, HOPE.

The $ 125 million Internet company NetManage develops Internet software solutions. The company also develops software for host access, messaging, file printing, collaboration, and desktop management. NetManage has the world's largest installed intranet SDK (Software Development Kit) base in the world, and over 55 million users worldwide.

NetManage solutions provide an open, standards-based, extendable architecture that allows customers to design information solutions to support business operations. Its products include Internet Chameleon, Chameleon Intranet Desktop, Eccopro 30, and NETWatch. Over 450 Fortune 500 companies are NetManage customers.

HOPE has targeted its businesses on high-growth niche markets, offering total solutions around world leading technologies. It aims to develop consultancy and service capabilities for global markets. The company has been functioning as the national distributor for Autodesk, but recently, it has also entered the transaction automation market by tying up with VeriFone.

HP in Tie-up with Informix, SAP

US-based Hewlett-Packard Company has announced a worldwide agreement with Informix and SAP, enabling HP to offer a Windows NT platform for SAP R/3 Rel. 3.0, and Informix OnLine Dynamic Server 7.20 on the HP NetServer LX Pro series. The SAP and Informix combination provides customers an integrated product with innovative database technology.

The HP NetServer LX Pro series is optimized to meet the performance and availability needs of business-critical applications. It supports up to four 166 MHz or 200 MHz Pentium Pro processors with a 512 KB level 2 cache per processor, delivering significant levels of performance and scalability. Dual PCI-peer buses deliver the balanced I/O throughput required to complement the exceptional performance of the Pentium Pro processor.

Scalability and high-availability are embedded within the HP NetServer LX Pro series, which has a large memory and storage capacity to handle large database applications, with ECC memory scrubbing, redundant power supplies, hot-swap disks, built-in disk duplexing, and server auto-restart.

Customers are expected to be able to place orders for the SAP R/3 Release 3.0 and Informix OnLine Dynamic Server 7.20 on the HP NetServer LX Pro series in the last quarter of 1996. SAP Logo partners plan to provide consulting and customization soon.

Wipro BT, Encompass, In Strategic Tie-up

Wipro BT has announced a strategic systems integration tie-up with Encompass Software and Systems. Both companies are Bangalore-based. The alliance will provide potential Wipro BT customers access to FTP's world-class network software solutions. Encompass Software is the country distributor and a value-added reseller (VAR) for FTP Software products in India.

The announcement comes close on the heels of Wipro BT's Systems Integration tie-up with Motorola ISG. According to the terms of the agreement, the systems integration tie-up will provide software for Wipro BT's VSAT- and VANS-based solutions, using FTP's products and Encompass' experience.

Supriyo Sanlay, product manager, Wipro BT says, "This association brings to the table the capabilities of Wipro BT as a service provider, and FTP's leadership in providing software solutions that will help provide effective and total solutions to a customer's networking requirements."

Adds Phani Sharma, MD, Encompass Software and System, "We are happy to be associated with Wipro BT, given its credentials as the only company to pro... both VSAT and VANS services, and ... en its proven expertise in implem... heterogeneous networks."

FTP Software is a leading ind... dent supplier of Internet solutions ... enable PC owners to access reso... across LANs, enterprise networks, ... the Internet.

Encompass Software and Systems ... leading solutions provider to variet... users for connectivity of heteroge... computer systems using FTP produc...

SMC in PC Server Compatibility Programm...

Standard Microsystems Corpora... (SMC) has been selected by IBM ... participate in IBM's new PC Ser... Compatibility program. The company ... also announced its support for IBM's pr... uct strategy designed to make it easier ... customers to build secure, reliable ... puter networks anchored with PC Serv...

The goal of IBM's PC Server Com... ibility program is to test product com... ibility across the major network opera... systems and provide required device d... and configuration information during ... stallation.

"Participation in IBM's PC Se... Compatibility program reinforces SM... commitment to customer service and ... hances the current relationship betw... SMC and IBM," says Lance Murrah, ... nior VP & GM, (system products d... sion), SMC. "IBM's selection of SMC ... this program demonstrates its recogni... of SMC as a major vendor in the netw... ing market."

SMC offers cost-effective ATM, ... Ethernet, and Ethernet adapters desig... to transport the traffic generated by ... mirroring operation of IBM's new se... clustering solution. In the Windows NT ... Novell NetWare environments, SMC ... ATM Power 155 adapter, combined ... an ATM switch, delivers a high-perf... mance, robust ATM LAN configura... For IBM OS/2, Windows NT, ... NetWare, the combination of SMC ... EtherPower 10/100 adapter and TigerSt... 100 Fast Ethernet hub provides one of ... industry's best price/performance Fa... Ethernet solutions available in the ... ket.

SMC products are distributed in I... by Mumbai-based C-Tel Infotech.

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IN BRIEF

ed Duck to Sell uarterdeck Products

angalore-based Red Duck Distribu- ion Company has landed a deal with Quarterdeck of USA, for bringing arterdeck's Mosaic and Larry Magid's ssential Internet to India. This is the first ntract that Quarterdeck has signed to ll its products directly in India. "An reement like this will guarantee the best ces for these products in India," com- nts, Sundeep Bhan, director, Red Duck.

Quarterdeck Mosaic and Essential ternet can play a key role in India's owing Internet needs. QD Mosaic brings e versatility and technological break- roughs of the Netscape Navigator with- affordable reach of the Indian market. ncludes all the functionality of compet- rs at half the price. Larry Magid's sential Internet, an all inclusive Web torial, is an ideal tool for the people of dia. Essential Internet is a fully inte- ated multimedia Web tutorial on CD- OM that allows the user to navigate the rld Wide Web without actually con- cting to the Internet.

surance Company elects Oracle RDBMS

ew India Assurance Company, a mem- ber of the General Insurance Compa- ny group, has selected the Oracle rela- nal database management system RDBMS) as the software platform for its ent/server applications. New Delhi- ed Oracle software India will supply acle RDBMS and tools products to be ed by more than 5,040 users in 73 offices the company. During the next year, re than 1,000 offices will implement Oracle software platform. The appli- ion software development has been rusted to Mafatlal Consultancy Servic- ity across all hardware and operating systems, sustained performance, scalability, and reliability. Oracle met all the requirements.

New India Assurance Company is the gest non-life, general insurance com- ny in the country with 1,200 branches ross India, and an annual turnover of arly Rs 20 billion.

According to officials of the company, e main selection criterion were portabil-

Flex Becoming Global Standard

Flex, the high-speed open paging protocol developed by Motorola, is fast becoming the de-facto global standard, with over 2 million Flex-based pagers active in the world. The protocol has been adopted by 67 operators across North America, Latin America, Europe, and Asia. These continents have the world's largest paging markets—China, USA, and Japan.

Flex code has been licensed to manufacturers for incorporation into pagers and paging system components. Currently, there are over 33 manufacturers licensed to produce equipment based on Flex, and another 30 are under active consideration. The policy of broad technology transfer has been further expanded by the availability of Flex chipsets. This enables all manufacturers to easily design and produce Flex-capable pagers, thus ensuring a wide selection of pager models offering Flex benefits to end-users.

Digital Launches 433/ 500 MHz Alpha Models

Digital Equipment Corporation strengthened its four-year claim to the world's fastest and highest-performance microprocessors with the announcement of 500 MHz and 433 MHz versions of its Alpha 21164 RISC (Reduced Instructions Set Computing) microprocessor. With peak execution rates of up to 2 BIPC (billion instructions per second), these chips push the performance envelope for high-performance computing, OLTP (On Line Transaction Processing), data warehousing, and visual computing applications such as videoconferencing, 3-D modeling, video editing, multimedia authoring, image rendering, and animation.

According to Anil Valluri, business manager (commercial computing), Digital India, "The Alpha 21164 500 MHz chip outperforms every other processor design available in the industry today, including Intel's Pentium Pro, SGI's R10000, HP's PA-8000, Sun's UltraSPARC, and so on. This announcement is in line with the roadmap of Alpha, which envisages doubling of performance every year, right into the 21st century."

Performance of the new Alpha 21164 500 MHz chip is estimated at 15.4 SPECint95 and 21.1 SPEcfp95, making it the industry's highest-performance RISC or CISC (Complex Instructions Set Computing) microprocessor for both integer and floating point operations. The Alpha 21164 433 MHz chip is estimated to deliver 13.3 SPECint95 and 18.4 SPECfp95.

Netlink to Forge Links

New-Delhi-based Netlink Business Systems, a company specializing in providing solutions in areas like systems integration, networking, and total electronic publishing, is forging alliances with a number of international IT companies to enhance its market influence in the country. Talks are in an advanced stage and the tie-ups will be announced soon. Netlink recently received the Commando Gold Cross award from Compaq India, for being the best Compaq reseller in the country. According to company officials, Netlink is also the largest reseller of Unicorp products. In an aggressive expansion campaign, the company is planning to open offices in the major cities.

The planned tie-ups will enable Netlink to offer complete solutions. It is trying to achieve a turnover of Rs 1 billion by the turn of the century.

CD-ROM on Bharat Natyam

Madras-based Info-Drive Software has released a CD-ROM title on Bharat Natyam, the classical dance form from the South. The product is in the form of an encyclopedia, and it has a rich collection of text, illustrations, and glossary. The write-ups capture the holy origin of the dance form through gestures, movements and footwork. The CR-ROM has over 50 *mudras* illustrated with line drawing. There is adequate text to explain each *mudra* and its usage. There is a glossary covering literally hundreds of technical and other terms associated with dance. An audio feature is also included.

Info-Drive Software hopes to sell 1,500 units of the title in the next three months. The product has already been introduced in the US market.

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AWARDS / APPOINTMENTS

Seacom Technology

Pune-based Seacom Technology, the master distributor of C-Net Technology Ethernet products in the country, has received the 'Outstanding Distributor of 1995' award from C-Net Technology. According to company officials, the performance of Seacom in the first six months of 1996 indicate that it continues to be among the top 10 C-Net distributors in the world.

In view of the sustained good performance of Seacom in the Indian market, C-Net has offered to set up a joint venture with Seacom. While talks are in an advanced stage, the two companies have agreed to call the joint venture C-Net India.

Compaq

US-based Compaq Computer Corporation has announced that its new Armada 4100 family of notebook PCs has recently won *Byte Magazine* and The Blenheim Group's prestigious "Best of PC Expo" award. "Best of PC Expo" is a competition which includes every product exhibited at the PC Expo trade show. Byte also awarded Compaq the extremely competitive "Best Portable" accolade for this year's entire PC Expo event.

Describing the notebook as a product that "satisfies the needs of a wide range of users," *Bite* announced the award during the exhibition, which attracted 142,323 people.

Compaq Armada 4100 is a flexible family of notebook PCs designed to meet the size and weight requirements of customers who want the flexibility to customize their notebooks to meet their specific needs. With its innovative and versatile design, the Armada 4100 family can be changed from a slimline notebook (1.5" thin and weighing about five pounds) to a standard notebook configuration with an integrated diskette drive (six pounds) to a multimedia powerhouse—all within the same advanced mobile design.

The Armada family of notebooks, which includes the Armada 4100 as well as the entry-level Armada 1100, was announced in June 1996.

"Receiving both the `best of show' and `best portable' awards from *Byte* and The Blenheim group demonstrates that Compaq has truly put a stake in the ground and is serious about regaining the lead in the portable marketplace," said Michael Winkler, senior VP and group GM (PC products group), Compaq.

Compaq Computer Corporation is represented in India by its wholly-owned subsidiary Compaq Asia.

Infotech Enterprises

B.V.R. Mohan Reddy, CMD, Infotech Enterprises, has been awarded the Hyderabad Manage-



B.V.R. Mohan Reddy.

ment Association's (HMA) 'Entrepreneur of the Year' award for the year 1996. N. Vittal, chairman, Public Enterprises Selection Board, presented the award to Mohan Reddy in Hyderabad recently.

HMA is a voluntary association of professional managers in Hyderabad. The 'Entrepreneur of the Year Award' is presented every year for exemplary entrepreneurship and innovativeness in choice of product, technology, or strategy, and achieving high levels of performance and growth. The award is sponsored by Nagarjuna Fertilizers and Chemicals.

InfoTech Enterprises Software Development Company specializes in computer-aided design/management (CAD/CAM) and geographical information systems (GIS). It is a 100% export-oriented unit exporting software to USA, Europe, and Australia.

Akshay Software Technologies

Haridas D. Raigada has been appointed VP, banking and financial services, at Akshay Software



Harldas D. Raigada.

Technologies of Mumbai. He will head the company's banking operations and banking software development division.

Earlier, Raigada worked as assistant VP with Mumbai-based Software Mart India.

Akshay Software Technologies is a leading software company providing high-quality solutions to clients worldwide. It is the distributor of the Centura product line.

Ajanta Pharma

M. Mohandas has joined Mumbai-based Ajanta Pharma as manager (IT).

A B.Sc. with a diploma in computer management, Mohandas has 15 years of experience in the field of systems and programming. Prior to this appointment, Mohandas was MIS Manager at Searle (India).

Ajanta Pharma is a medium-sized pharmaceuticals company



M. Mohandas.

focusing on health care. It was awarded the status of an export house recently.

Aptech

In a minor restructuring at Aptech, a leading computer education and training company, Ganesh Natarajan has been ap-



Ganesh Natarajan.

pointed MD. He was functioning as CEO, Aptech. He was also director in-charge, Aptech (Bahrain), and Hexaware (India, Europe, and USA).

A gold medalist in mechanical and industrial engineering, Natarajan has had extensive experience in manufacturing, IT, and management.

Natarajan has held many leadership positions. He started his career as head (planning and systems) at Crompton Greaves and later took over as CEO, Aptech.

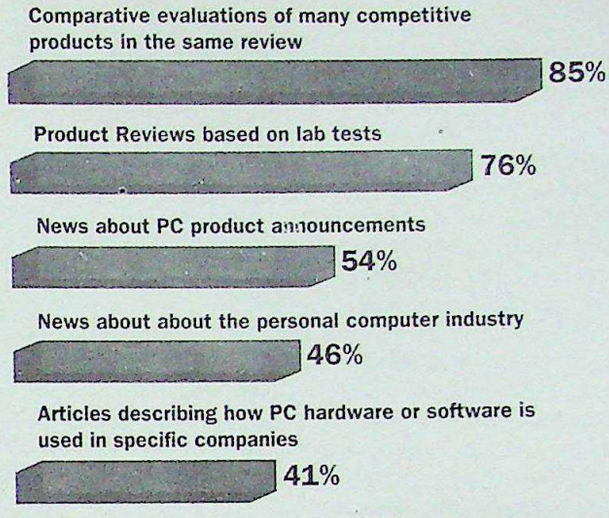
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PC Magazine is written with PC buyers in mind. They are technically astute, involved in buying a wide variety of products and deeply interested in getting up-to-date information on specific products and technologies. And in study after study, buyers say that they value ***comparative product reviews*** above all other types of information when making buying decisions. That's why PC Magazine devotes the lion's share of its pages to comparative, category-wide product reviews. This adds up to hundreds of pages each year ***on every product category***. These reviews give buyers what they can't get anywhere else: comprehensive evaluations of every product in a given category. That means a comparison of 80 laptop computers, 100 printers, 20 Windows desktop packages or 18 high-end Token Ring adapters.

PC Magazine's editorial approach reflects the needs of the buyer

Specific types of information rated "important"
By vendor-supplied lists of buyers



Source: Customer List Studies — Averages



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AutoLISP And Customization Made Simple

By N.K. Bhagat

BPB Publications, B14 Connaught Place, New Delhi 110001.

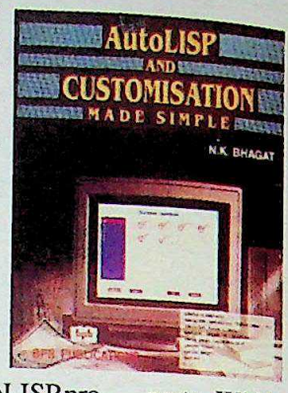
Price: Rs 150 Pages: 192

The popularity of AutoCAD in India can be gauged from the fact that it is the most widely-used package after operating systems like DOS and Windows, and wordprocessors like WordStar and Word.

The most insurmountable limitation of AutoCAD is that deft handling of the package requires a basic understanding of engineering and design concepts. Even experienced draftsmen used to manual drafting can switch over to AutoCAD only through patient learning and extensive guidance.

AutoLISP And Customization Made Simple targets experienced draftsmen who wish to extract the maximum from the package by modifying its commands and functions to suit their specific requirements. This can be achieved in AutoCAD with the help of AutoLISP, a high-level programming language, which is an integral part of the package.

With the help of AutoLISP, experienced AutoCAD users can effect optimal customization. However, effective customization through the use of AutoLISP presupposes that the user has the rudiments of the language on his finger tips. The author's claim that even novices can start writing scripts and simple AutoLISP programs after completing this book, is not very convincing.



The book is designed as a tutorial and not as a reference guide. The implication is that it follows a rigid step-by-step approach, and the reader is advised against skipping intermediate sections. On the positive side, each chapter has adequate examples and wherever possible, information is provided in the tabular format.

AutoLISP And Customization Made Simple is divided into two parts. While the first part deals with the advantages and procedures of customization, like the creation of macros for a set of interconnected operations, the second part covers how the AutoLISP programming language can be used to customize parameters and settings.

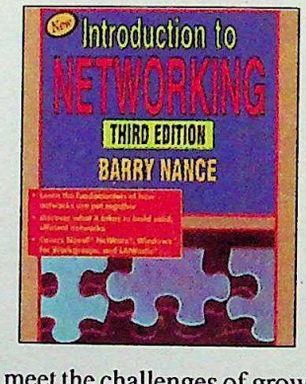
Introduction to Networking

By Barry Nance

Prentice Hall of India, M-97 Connaught Circus New Delhi 110001.

Price: Rs 150 (Indian Reprint) Rs 952 (Original US Edition) Pages: 428

In the corporate work environment, networking is gradually becoming the norm. This is because networking offers unparalleled advantages and cost savings. *Introduction to Networking* is a treatise on the expanding world of networked computers. It is not intended as a manual for networking personnel, though it does include practical information on how a network can be built from scratch. The title will suit all those who wish to acquire knowledge on different types of networks, their essential components, how they function, and what all they can be made to perform. It will be an asset to corporate decision-makers who plan to set up Lans, or wish to expand their existing networks



to meet the challenges of growth and diversification. The information provided is of a general nature, and will be ideal for students who wish to acquire a firm grounding in the basics of networking. It does not have anything specific for the network specialist. Nevertheless, the carefully organized sections and the selective information provided in the chapters make the title a valuable reference guide.

The first chapter is a detailed overview of the current networking scenario. The author discusses Lans, Lan components, servers, workstations, adapters, and a host of other crucial networking essentials. The second chapter is on resouce sharing, and the third on e-mail. Chapters 4 to 6 discuss network creation through the use of building blocks like servers, workstations, cables, adapters, and networking protocols. Chapters 7 to 10 discuss networking software.

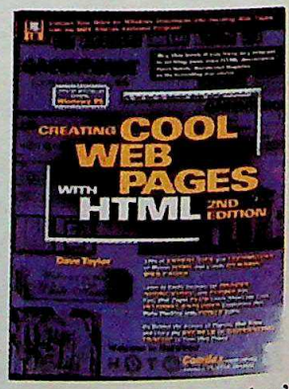
Creating Cool Web Pages With HTML

By Dave Taylor

Comdex computer publishing, Pustak Mahal 10B Netaji Subhash Marg, New Delhi 110002.

Price: Rs 195 (Indian Reprint) Rs 900 (Original US Edition)

Even a couple of years ago, the reach of the Internet in India was limited to educational institutions and research organizations. Today, it is not enough to own an Internet account. A new breed of professional home-page makers has sprung up in Delhi and Mumbai. Very soon, page creation for the Web will become as commonplace as creating layout in PageMaker. Those who ignore the emerging trend of leveraging the Internet for professional and business gains run the risk of being left behind. *Creating Cool Web Pages with HTML* is a timely reminder. It tackles the problem of page creation from the perspective of the hypertext markup language (HTML), the language that is at the root of the Web's search potential. In other words, it discusses the creation of HTML documents for fun, information, business, and entertainment. Crucial aspects like the incorporation of images, audio and video clips, and forms into Web pages are discussed in detail. Unfortunately, to understand the basic concepts underlining HTML, and to grasp the full potential of HTML, the user must have a thorough background of the Internet, the World Wide Web, and how information is displayed, located, and retrieved from Web sites. As the book is on HTML, it takes many things for granted. Chapters 3 to 7 discuss the essential elements of



HTML document creation, including the creation of head and body information, page titles, lists, and adding pointers and hot links to documents. There are separate chapters on HTML extensions in Netscape Communications Corporation's Netscape Navigator, and Microsoft Corporation's Internet Explorer. There is a chapter on the functioning of Web search engines and search applications like Yahoo and WebCrawler.

—Hirendra Chatterjee

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BETTER GOVERNMENT? SURE IN THE INFORMATION AGE

benefits of online interactivity are of potential importance—or are so often looked—as the Internet's promise for proving democracy.

Personal computers hooked to interac- networks will empower citizens to par- ate in the democratic process and civic ers with an ease and immediacy almost eard of today.

The very nature of political dialogue will ve as it becomes common for people to ess public information and interact elec- ically with government agencies, as well with each other.

The Internet is the first medium that will e it easy for citizens to explore and ticipate in the issues of the day, as much as little as they like. This will put the zen in a fundamentally more powerful sition than ever before.

It will strengthen democracy and provide of conveniences, too. Say you're at home you wonder, "What are the crime statis- for my neighborhood?" Or, "If I went n to court this afternoon, what would I ?"

It's not easy to get this kind of informa- now. But imagine that your computer or evision screen could display pictures of vernment buildings, and you could click the police headquarters to see crime sta- ics, or the courthouse to see the day's cket.

This kind of capability is coming, and en it arrives, it will make it far easier to get vernment information.

When you get a property tax bill these s, you may wonder whether it's fair and at your neighbors pay. Property tax records public information in many places, but ding the facts usually requires a trip to an ce—and probably some patience, too.

Some day, your computer will respond to r spoken request: "Please list the homes my neighborhood and their tax bills." It ly will be that simple.

Existing forms of information about gov- ment—newspapers, TV, radio and gov- ment publications—won't lose their im- tance. But the Internet will add some- g new. It will enable people to delve re deeply into public records and topics of erest, listen to an important political de- e and, perhaps most importantly, exchange inions with others about those issues.

Personal computers and information net- rks are empowering tools. They give indi- uals many of the same kinds of advantag- that once were available only to big com- ies and organizations.



> *I'm an optimist about information technology because I've seen how it can improve the effectiveness of businesses and how it's beginning to positively influence education.*

For example, a kind of software program called an "agent" will watch the Internet, keeping an eye trained for information that might interest you.

Today only large companies and special-interest groups tend to invest in the resources necessary to routinely track issues. They employ lobbyists and attorneys to watch out for legislation or proposed agency rules that might impact their affairs.

Ordinary citizens can't afford this, which is one reason that special interests have disproportionate influence in many corners of government.

But your software agent on the Internet will inform you if a government agency is contemplating something that will affect you—if an apartment developer has filed plans to build next door to your home, or if your child's school could be closed due to budget cuts.

Governments are a source of enormous amounts of information, most of which never reaches even those citizens who would be most keenly interested in it.

The information output is so great that many countries have their own printing offices. In England, it's called Her Majesty's Stationery Office. In the United States, it's called the Government Printing Office (GPO).

The GPO is the world's largest printer. It offers thousands of books, reports, pamphlets, and other publications written by federal agencies.

The office will give or sell you everything from children's reading lists to the Congressional Record, but you have to be willing to take the time and trouble to sift through the available material, order it, and wait for it.

It's hardly convenient compared to what the Internet can offer, although some of the GPO's content is now up on the World Wide Web (at http://www.gpo.gov).

A lot of information also flows from citizens to governments. The amount of time individuals spend filling out forms, waiting in lines, and holding on the telephone is staggering.

The Internet can change much of that by letting people interact with government electronically at their convenience.

Voting is an important example of an information activity that could be improved with the help of the Internet.

Where I live, we vote for judges, but I often don't know who deserves my ballot. Since little information about their judicial records is readily available.

I look forward to an Internet-based alternative. Instead of voting in person or mailing in an absentee ballot, I expect to be able to vote from my PC.

While pondering the choices at my leisure, I'll be able to see what the candidates say about themselves, listen to speeches they've given, check their judicial records, read or watch news reports, survey their endorsements or the recommendations of non-partisan groups, or even ask individuals I trust who they intend to vote for—all electronically.

The result will be a better-informed vote, and probably greater participation.

I'm an optimist about information technology because I've seen how it can improve the effectiveness of businesses and how it's beginning to positively influence education.

It's no secret that many governments could be more efficient and responsive, and I'm confident that PCs and the Internet will play a welcome role in improving civic life and political dialogue around the world.

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Questions may be sent to Bill Gates by e-mail. The address is askbill (AT) microsoft.com.

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EVERYBODY'S TALKING

THE BUDGET WILL PROMOTE GROWTH

By Dewang Mehta

For PC users in the country, P. Chidambaram (PC?) became an instant hero when he announced a huge cut in duties on computers in his maiden budget speech. The youngest ever finance minister of India said in his speech, "The salient features of my proposals are.... Reduction in the rate of duty on computers for giving a boost to the software industry". This statement was enough to cause jubiliation among PC users, but brought utter disappointment to the local hardware industry.

The sweeping reduction of duty by the finance minister brought down the prices of imported computers in the country by almost 10-15%, and of locally assembled computers by about 3-5%. However, the finance minister also imposed a 2% special import duty, thereby marginally increasing prices of software and hardware in the country.

Typical post-budget prices of a 'brand' 486 machine works out to be in the range of Rs 50,000-55,000, whereas a Pentium machine will now be in the range of Rs 75,000. This clearly indicates that computer prices in the country are slowly coming down to international levels. In the international market, a 486 machine with a standard and 'decent' configuration normally costs US $1,000. Thus, the gap between international prices and Indian prices for the same kind of PC is roughly to the tune of Rs 15,000-20,000. It is imperative that future policies of the government of India, those of manufacturers, and higher volume sales will eventually force this price differential to disappear.

For India to increase its penetration of PCs from the current level of one per thousand to the year 2000 target of 10 per thousand, we require a healthy co-existence of local hardware industry, multinationals, and street-side computer assemblers (not grey market operators).

It was not surprising that the finance minister's decision to reduce duty on computers and peripherals from 40% to 20% evoked a cry from indigenous hardware manufacturers. For the first time, the duty differential between end-product and sub-assemblies have been removed, reducing the viability of local manufacture. Added to this, the finance minister did not announce any reduction in excise duty on computers, peripherals or assemblies. Reduction of excise duties was one of the major demands of MAIT—the computer hardware industry association.



> ***The duty differential between end-product and sub-assemblies have been removed, reducing the viability of local manufacture.***

This action has also further decreased the price differential between imported and domestic computer brands. According to experts, the price differential between domestic and foreign brands was Rs 12,000 for the same machine before the budget. It has decreased to Rs 5,000 in the post-budget era. Multinationals have welcomed the duty reduction and said that they will try to pass on the benefits to their consumers. Another major demand of the hardware industry was to increase the depreciation rate for computers from 25% to 50%. The finance minister did not accept this demand.

The budget did not impose any excise duty on computer software. Computer software continues to attract nil excise rates. However, the finance minister levied a 2% special import duty on all imports. The new customs duty rate on computer software, irrespective of storage media (e.g. CD-ROM, floppy disk) will be 12%.

The finance minister reduced import duty on all kinds of CD-ROMs from the earlier high of 25% to a new low of 10%. Obviously, a special import duty of 2% will be added to this. However, end-users who do not enjoy the benefits of the MODVAT scheme must pay an import duty of 10% +2%, +20% (CVD)=34%.

While making imports easy, Chidambaram hit out at certain categories of exporters by introducing the concept of a Minimum Alternate Tax (MAT) on companies. It is very clear that MAT will adversely affect claims under section 80 HHE of the Income Tax Act, which provides for tax exemption on profits derived from software exports.

NASSCOM is glad that software units registered under the 100% EOU, Export Processing Zone, or Software Technology Park schemes, availing income tax benefit under section 10A/10B of the Income Tax Act, will not come under the purview of MAT. Companies that will now have to cough up more tax are the ones who have been availing tax benefit under Section 80 HHE of the Income Tax Act, which provides for total tax exemption to profits derived from software exports. MAT will reduce the competitive edge of the Indian software industry. NASSCOM has urged the finance minister to keep software exporters outside the purview of MAT, especially when countries like USA are imposing non-tariff trade barriers on the Indian software industry.

However, it is evident that Chidambaram has a keen desire for better and greater use of IT in the country. In his budget speech, he hoped that insurance companies will be computerized. He also asked the excise department to use IT and possibly have on-line connectivity with assesses.

According to industry experts, the ultimate result of these budget proposals would mean growth of at least 40-45% in the hardware sector. According to an estimate, in 1995-96 alone, 3,40,000 computers were sold. In the current year, this figure is expected to rise to about 4,70,000. The domestic software market is expected to grow by almost 60% in the current year, which means a turnover of over Rs 27 billion. However, MAT provisions may reduce the pace of growth in software exports, and the total turnover of the software industry in 1996-97, including the domestic market, may be just about Rs 64 billion against Rs 41.9 billion in 1995-96. □

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EDITORIAL

By Kirtimaya Varma

TV, and Not PC, Can Make PC Revolution Universal

Can the PC revolution spell the end of the PC?

The seeming contradiction in the above question may be apparently baffling; nevertheless, there are stray signs that the answer may be yes. No, I am not referring to the $500 network PC which is said to make the conventional PC obsolete. Notwithstanding the claims of the likes of Oracle and Sun, network PC has a long, long way to go before it can really be a threat to the conventional PC. And even if it were to make the conventional PC obsolete, the network PC will still remain a PC, and PC will live on in a different form.

One cannot but be aghast at the speed with which the IT industry is throwing up ideas. The idea of network PC has been around for just a year and has hardly crystallified; but we are hearing the sounds of its death, brutally killed by the so-called Net TV. Net TV, though not exactly a



rage, has been attracting more and more attention not only from IT professionals but even from a typical media consumer. And why not? If your TV can be made to work with the Internet, you can have the best of both the entertainment and computing worlds.

Take the most IT-conscious nation in the world—the USA. While almost every American home has a TV and a telephone, the PC density is 256 per 1,000. At the other end of the spectrum are poor Third World countries like India, with a PC density of hardly 1 per 1,000 against the world average of 25, and a TV population of over 50 million, with nearly 5 million TVs added every year. The point that I want to make is this: the PC will never become as pervasive as the TV, and if the TV can also do the job of a PC, the PC revolution will surge ahead like never before. The reason is simple to see. The Internet hardly offers any entertainment programmes, and in the foreseeable future is unlikely to offer any which can even remotely match those on the TV. The delay of few seconds inherent in getting anything downloaded on the screen from the Internet precludes its use as a means of entertainment. And entertainment is what is most sought on the screen, by the rich and poor, young and old, big and small, ruler and ruled, palace-dweller and pavement-dweller. If a person has to buy a machine just to get IT on his desk, he will think one hundred times, because he is likely to have many other priorities over IT; but if he has to buy a machine for entertainment, which can incidentally be used for accessing IT, he is likely to go for it once his basic needs of food, clothing, and shelter have been met. The high premium on entertainment that we place can surreptitiously bring the PC revolution, symbolized by Internet connection, into almost every home, but the irony here is that the PC in its known form will have to die to enable PC revolution become as universal as entertainment.

A study has shown that even in the USA many PC owners feel that their investment in the PC has not been fully justified, and there are a good number of people who see little use of their PC. But it is unlikely that anyone will feel his investment in a TV unreciprocated. The PC revolution, if riding piggyback on the entertainment revolution, can reach every nook and crevice of society; but if the PC revolution were to ride on the back of the PC, it will remain confined to the elite, however cheap the PC may become.

It is in this context that the Net TV provides the potential of becoming the biggest consumer electronic gadget. In its simplest form, it would consist of a television with two ports on the back, one for cable and the other for Internet connection (usually a telephone line). Once the link to the Net is established, viewers will be able to navigate Websites as they now surf TV channels. Not only this. Extending the concept of network PC to the Net TV, one may be able to use his Net TV for all kinds of applications that are presently available on the PC, by directly downloading operating system and the relevant part of application software from the Net into the Net TV.

Such TV-PC hybrid has already seen the light of the day. Gateway 2000 is selling Destination, a $3,500-to-$4,500 Net TV. Its competing product, WorldVision, was introduced March last by Net TV Inc. Compaq and RCA are also working on Net TV. Apple's much delayed Pippin computer is a TV plug-in Net browser and CD-ROM player.

While the technology for Net TV is taking shape, experts believe that some psychological adjustments may be necessary for the Net TV to be universally accepted. The TV is generally watched from a distance of 10 feet or even more, while the computer monitor is hardly 2 feet away from the eyes. One is unlikely to keep on changing his distance from the Net TV while flitting from TV to computer or vice versa. Reading screenfuls of text from a distance of 10 feet will be very eye-straining. Net TV designers say that they will solve this problem by redesigning Web pages for larger type, but that will limit the number of words that can fit on the screen. It may take a number of scrolls to read one page. Whether this will be able to deliver the complete Web experience remains to be seen.

While Net TV will induce people to try the Internet, it is unlikely that people will remain glued to it unless Internet can be made more interesting. However info-rich the Web is today, it is a poor entertainment medium, with pages offering merely still pictures, graphics, and plain text; and this contrast will become more starking when juxtaposed with TV programmes.

Net TVs may have to face a major marketing challenge. Microsoft, which along with Netscape dominates the Web-browsing market, will spare no efforts to kill Net TV, lest it loses its grip on the software market. It has the sinews to introduce the newest and whizziest Internet embellishments which do not work right on Net TVs, so that conventional PC users keep on getting more than Net TV users. Will Net TV programmers be able to keep up with the marketing clout and genius of Microsoft? □

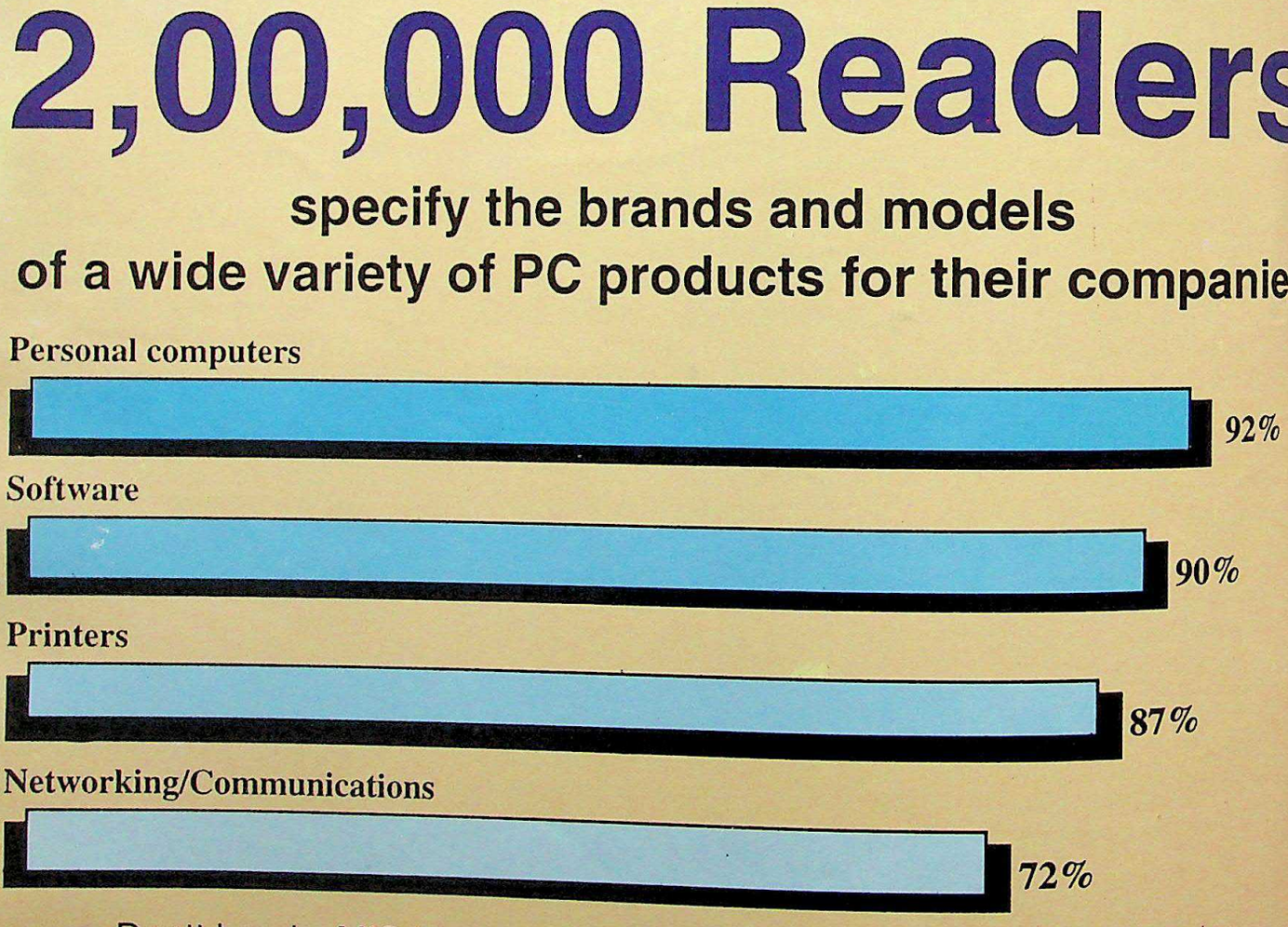
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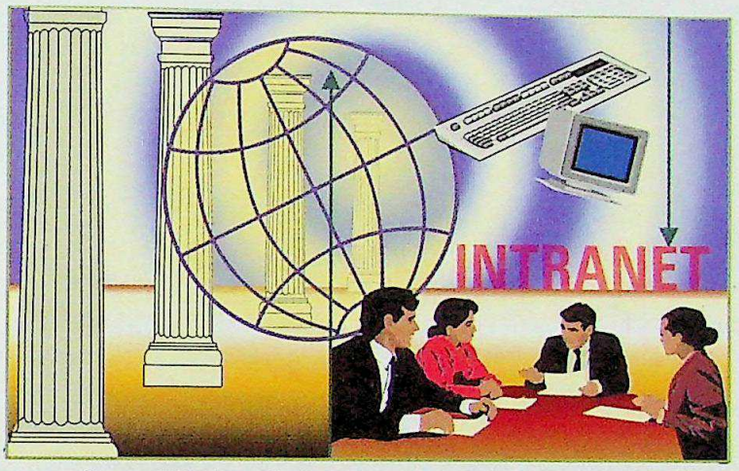
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Trends

TRENDS & TECHNOLOGIES SHAPING THE PERSONAL COMPUTER MARKET

The Intranet Onslaught

Microsoft, Netscape, and Lotus shift the Net to corporate desktops.



The Internet is the global network that will stitch together companies and all kinds of customers," said Microsoft CEO Bill Gates at the company's recent Intranet Strategy Day in San Jose, California. Gates made quite a few announcements regarding product plans, many of which revolved around Microsoft Windows NT. On the server side, Windows NT 4.0 should ship with the 64-bit Windows NT 5.0 shipping by the second quarter of 1997. Windows NT 4.0 will integrate Microsoft's Front Page for Web authoring and site management and will offer sophisticated searching and indexing. A next-generation Windows NT Directory Server will be available to developers later this year, and Normandy—the platform on which the Microsoft Network is based—will be made widely available as a high-end public network server for telephone companies and Compuserve, among other customers.

On the client side, Gates emphasized the intranet features in the upcoming Office 97 applications suite and Internet Explorer, which will inherit Microsoft's Net Meeting technology for sharing applications. Gates also emphasized the Active Desktop—based on the use of ActiveX controls—as the key to Internet Explorer 4.0. Office 97 will, according to Gates, "move us from a document-centric focus to a Web-of-pages focus where everything, including your desktop, is a page with links." In one of several demonstrations, a Windows desktop displayed several Active Desktop features. The desktop itself was a Web page, featuring links to the intranet pages of a pharmaceutical company, a rolling ticker of stock quotes, and a shortcut icon linked to a Web page.

Netscape and Lotus have responded to Microsoft's announcements with their own far-reaching intranet strategies. Netscape has plans to integrate a next-generation version of Navigator, called Galileo, and a next-generation version of SuiteSpot, called Orion, into a full-service intranet strategy. Netscape is developing an Internet operating system that manages files and hosts apps. It's also making its server software cross platform. The company is betting on Sun's Java to usher in a new breed of cross-platform intranet apps.

Lotus has announced a new line of Web servers (code-named Domino II), including one based on Internet-only standards, as well as a line of Web servers, clients, and tools designed to integrate with Lotus Notes. The first in the line of Domino II Servers will feature a Notes-based object store and support for Common Object Request Broker Architecture (CORBA), to enable storage and retrieval of objects in many different formats.—*Sebastian Rupley*

The Web—Without the Wait

The latest in high-speed phone lines.

For the serious Web surfer, it would be a dream come true: simultaneous voice service and Web access—at speeds of up to 400 times as fast as a 14.4-Kbps modem—all over a single phone line. That's what AT&T Paradyne, based in Largo, Florida, is promising with its new GlobeSpan Rate Adaptive Digital Subscriber Line (RADSL) technology.

RADSL holds out some tantalizing features: Web-site graphics that require 6 minutes to display over a 14.4-Kbps modem appear in less than 1 second over RADSL's 600-Kbps to 7-Mbps "downstream" channel from the Web to your PC. The "upstream" channel blasts data back to the Web at 128 Kbps to 1 Mbps.

RADSL speed adapts based on the length and signal quality of an existing phone line, ensuring higher-quality transfer over longer distances.

RADSL is a variation of ADSL (Asymmetric Digital Subscriber Line), which phone companies conceived as a way to deliver movies. (ADSL specifies a 6-Mbps channel from the phone company's central office to your PC and a 64-Kbps channel in return.) This concept was fine for its original purpose but isn't so great for the Internet. RADSL speed adapts based on the length and signal quality of an existing phone line, ensuring higher-quality transfer over longer distances.

AT&T Paradyne is positioning GlobeSpan RADSL as a way for phone companies to protect their customer base against other Internet access technologies, especially cable. But don't count on either technology to reach your PC anytime soon. The local phone companies will have to install complex digital backbone systems, and the cable firms face the investment in two-way cable.

Meanwhile, wireless Web access may turn out to be the real challenger.—*Frank J. Derfler, Jr.*

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Internet Phones Take Shape

The first ones will arrive this summer.

Northern Telecom and Sun Microsystems have joined up to incorporate Sun's Java software platform and Java-powered chips into telephones for a host of intranet and mainstream Internet applications.

The costs for the phones will be in the $500 range, and many applications are targeted at accessing Internet services. For example, a realtor could use one of the new wireless or desk telephones to call up an Internet multilisting database for a brief description, a price, and even a small photo of a piece of property—all displayed on the telephone's screen.



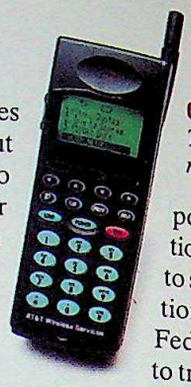
JAVA PHONE: *Nortel foresees Java apps on its Internet phone.*

Nortel plans to demonstrate Sun's Java technology in its screen-based telephones this summer. The agreement between Nortel and Sun is aimed at letting developers create unique Java-compatible applications and services. Customer trials are expected to take place in 1997.

"We want an open system that will compel software developers to create all kinds of applications for enhanced telephony," said Rick Faletti of Nortel.

Details on the technology behind the Nortel/Sun phones aren't available yet, but AT&T is also gearing up to ship its Internet phone later this year. The $500 phone (with $50 to $80 average monthly service charges) is a standard cellular phone, capable of 19.2-Kbps data transfers; it can access a subset of the Web's pages via a dedicated AT&T server. The phone has a 3-line, 22-character-wide screen designed to access pages formatted in HDML, an HTML offshoot.

AT&T's phone will target corporate intranet applications, such as instant access to sales data. In demonstrations, the phone accessed Federal Express's Web site to track a package, got stock quotes, checked the weather, and accessed Web-based flight-reservation information. AT&T will make a software development kit available later this year.—*Sebastian Rupley and Brian Nadel*



CALLING INTRANETS: *AT&T's phone/browser will retrieve corporate data.*

The Net, via Thin Air

Wireless Internet service reaches more cities.

It sounds like a fantasy: unlimited, wireless Internet access for 30 bucks a month. In a few U.S. cities, that fantasy is as real as the wired connections to which the rest of us are chained.

Metricom, a Los Gatos, California–based Internet service provider, offers freedom from the phone system with transmission rates that rival wired connections of 14.4 to 28.8 Kbps. Metricom provides this service via a system of shoebox-size radios spaced at half-a-mile intervals and mounted atop utility poles. Users access this local-packet radio network via Metricom's Ricochet radio modem, a small external box that costs $299 to buy or $10 per month to rent, in addition to the costs of Metricom's Internet service provision.

The Metricom network connects to the wired world via Wired Access Points (WAPs), which receive 1K packets from the pole-top radios and pass them to Metricom's frame-relay network. The company is in the process of installing a nationwide frame-relay backbone.

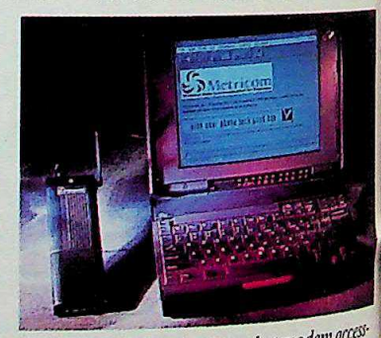
The Ricochet modem communicates with Metricom's network via a standard TCP/IP link. That leaves you free to use any TCP/IP software, including the Windows 95 TCP/IP stack and browsers such as Microsoft Explorer and Netscape Navigator.

If there's a fly in the ointment, it can be summed up in a single word: coverage. Metricom's technology must be installed on a locality-by-locality basis, which means getting permission from local city councils. So far, the company has wired the entire San Francisco Bay area and will bring Seattle and Washington D.C. into the system this summer.

"It's our objective to be nationwide," Wood says. He estimates—perhaps optimistically—that it'll take two to three years to cover all of the major U.S. cities. College campuses, including Berkeley and Stanford, are among the first areas in Metricom's network. The Bay area airports are already online, and D.C.'s Dulles and National airports are on the agenda. The network is also in use at Microsoft's Redmond headquarters.

"This is extremely real," says Dan Croft, a product manager in Hewlett-Packard's OmniBook division. HP uses the Metricom system at several of its campuses. "We have quite a few people outfitted with the Ricochet modem," he reports, "and we're using it for both Internet and intranet access."

If it does go nationwide, Metricom could represent stiff competition for packet radio networks like ARDIS and RAM Mobile, which don't provide direct TCP/IP connectivity. "Right now they're complementary services," says Croft, adding that "Metricom is great if you're in a covered metropolitan region. RAM is great if you're mobile between regions."—*Jonathan Matzkin*



WIRELESS WEB: *The Ricochet modem accesses Metricom's expanding radio network.*

PRODUCT REVIEWS

Product reviews in *PC Magazine India* enable decision-makers in the corporate sector ranging from CEOs to EDP executives to select the products that meet their specific requirements.

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Dusting for Prints—On Your Intranet

Fingerprint ID technology for the PC.

As widespread Internet commerce looms closer and corporate intranets proliferate, an unsung security technology—fingerprint identification—is heading for high-profile commercial uses. Companies big and small, including Harris, Identix, Oracle, and Verifone, are now preparing fingerprint ID solutions.

According to Karl McCalley, vice president of Harris's Authentec division, "Fingerprint ID technology has dropped in price dramatically, and it beats password schemes, because a password can be used by anyone."

Harris has developed an inexpensive line called FingerLock



POSITIVE ID: *Identix's fingerprint ID device collects 250K of digitized data.*

Products that will show up first in portable PCs from several as-yet-unnamed manufacturers. Harris's FingerLock mechanism for portables is based on a matchbook-size platen that sits on top of an integrated circuit. To gain access to the notebook, the owner places a finger on the platen and a chip collects fingerprint ID data (called minutia), which is then matched with the owner's previously saved set of minutia. McCalley says the device costs under $100.

Oracle is working with Identix of Sunnyvale, California, to incorporate support for Identix's fingerprint ID hardware and software into the Oracle 7 database. Identix's devices work much like Harris', and prices are in the $200 to $500 range. Identix's CEO, Randy Fowler, says the devices will start showing up soon in several intranet environments that use Oracle databases.

Fingerprint ID technology still faces several hurdles. Costs are still relatively high for fingerprint ID devices, although Identix's Fowler says volume could drive the costs way down. Competitors, such as Microsoft's digital signature technology, also loom. Still, fingerprint IDs are extremely accurate—with an error rate of about one read in 100,000 transactions, according to Verifone's Lewis—and a fingerprint can't be owned by more than one person. According to Identix's Fowler, "electronic commerce is not really going to happen until this kind of total security is in place."—*Sebastian Rupley*

Intel Pushes Pentium Pro

Videoconferencing and "hybrid apps" drive production.

At Intel's annual New York Analyst Meeting in the spring, talk of microprocessors was but a side dish. The company's end-of-millennium plans—as outlined by its executive officers—involve smaller, faster versions of the Pentium Pro, although the industry's leading chip manufacturer is also showing serious devotion to Internet multimedia and to what it calls "hybrid applications."

As Craig Barrett, executive vice president and chief operating officer, explained, Intel continues to adhere to Moore's Law, which states that the number of transistors per chip doubles every 18 months. The company predicts that silicon scaling will reach its physical limit by the year 2017. Meanwhile, current manufacturing processes continue to deliver higher performance from smaller chips. A new 160,000-square-foot chip factory—Intel's twelfth—will initially adopt the 0.35-micron process that Intel has used since 1995, but will then adopt the 0.25-micron Pentium Pro process by the middle of next year. By then, production of the Pentium Pro will have surpassed that of the Pentium.

According to Intel executive vice president Gerry Parker, smaller die sizes will lead to faster production, or "ramp," for the Pentium Pro. As the number of processors that can fit onto a wafer increases, the defect density of each wafer stays the same. As a result, the number of defective chips decreases.

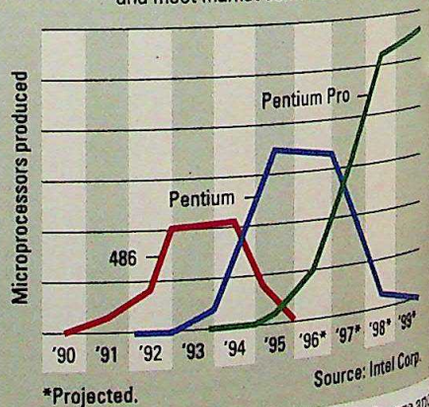
The Pentium Pro, the company predicts, must ramp faster in order to keep up with two software trends: increased Internet use and the widespread adoption of Microsoft Windows NT 4.0. Intel's primary goal is to drive the "Connected PC," a multimedia machine that offers Internet access, videoconferencing, and Universal Serial Bus support. To this end, the company is focusing on its ProShare videoconferencing software and the promotion of "hybrid applications"—multimedia apps that deliver complex content via CD-ROM and use the Internet for interactivity.

Intel ProShare, which already controls 42 percent of the ISDN videoconferencing market, has just entered a second release that's multipoint-enabled and multilingual. More important, ProShare VideoPhone for the Home plugs into an ordinary phone jack.

Most impressive is Intel's Intercast project, which is designed to deliver Web pages over broadcast TV signals. An Intercast browser receives the signal, displays the TV feed, and caches Web pages so you can delve deeper in a program's subject matter as it airs.—*Cade Metz*

Processor Life Cycles

With more efficient manufacturing methods, Intel is able to ramp up Pentium Pro production quickly and meet market demand faster.



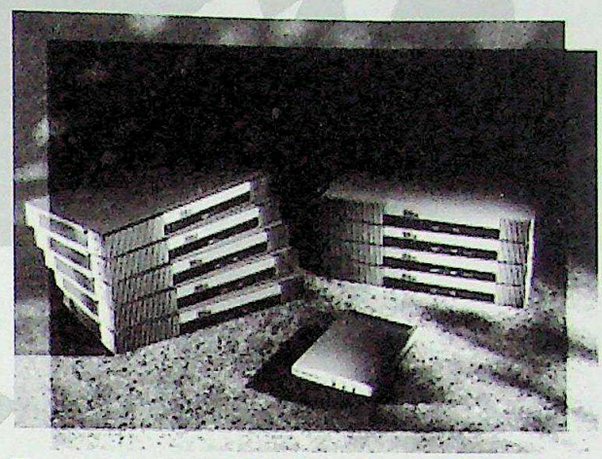
Top CD-ROMs

1. **Microsoft Windows 95 Upgrade** Microsoft
2. **Warcraft II: Tides of Darkness** Blizzard Entertainment
3. **Civilization II** MicroProse Software
4. **Print House for Windows 95** Corel
5. **Myst** Broderbund Software
6. **Print Shop Deluxe CD Ensemble** Broderbund Software
7. **TurboTax Deluxe** Intuit
8. **Toy Story Animated StoryBook** Disney
9. **Microsoft Plus! for Windows 95** Microsoft
10. **Quicken Deluxe** Intuit

*Source: PC Data. Data for May 1996.

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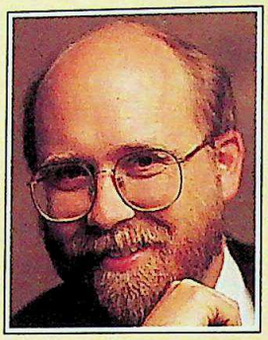
By Jake Kirchner

Japanese Firms Have a New Yen for U.S. PC Dollars

One of the enduring mysteries of the PC industry has been the near nonexistence of Japanese computer makers here in the U.S., the world's largest market. Granted, NEC has gradually built decent market share in the consumer market, and Toshiba's U.S.-based subsidiary continues to be a leader in the portable field, but without exception, the major players for the last 10 years have been homegrown companies. (The Japanese, of course, have been major component suppliers.)

Perhaps emboldened by the quick success here of Taiwanese PC-manufacturer Acer, key Japanese computer and electronics firms are now making forays into the market dominated by Apple, Compaq, Dell, Gateway, Hewlett-Packard, IBM, and Packard Bell.

Fujitsu and Hitachi are hoping to move beyond the mainframe business and build U.S. market shares in notebooks, a segment in which Hitachi already dabbles. Toshiba is looking to parlay its industry-leading position in notebooks into equal prominence in desktop computers. And Sony, ending a 12-year hiatus from the PC world, is jumping into the home-PC side of the business with a new lineup of high-end multimedia machines.



It's safe to say the Japanese firms face an uphill road to gain the market share they'll need to be profitable.

It's too early to predict how well these companies will do in the U.S., but it's safe to say they face an uphill road to gain enough market share to be profitable. Even the industry leaders have learned that the PC business is a tough way to make money. Constantly evolving technologies, razor-thin profit margins, expensive support operations, and tight-fisted, hard-to-please customers make it extremely difficult to realize a profit.

Many of the top vendors over the last couple of years—Apple, AST, IBM, and Packard Bell, to name the most prominent—have struggled to attain or retain profitability in hardware sales. The failures have come about for diverse reasons, from high R & D costs to misjudged customer demands, but in this fast-paced, volatile industry, even the simplest misstep can mean hundreds of millions of dollars in annual losses.

Given these market realities, why is the PC business expanding so rapidly? No doubt, it's because the market is so huge and growing so quickly, it's impossible to sit on the sidelines. And, let's face it, it *is* possible to make money. Companies targeting specific niches that allow better margins do nicely, and companies with manufacturing efficiency and marketing prowess make up in volume what they can't attain in profit margins.

As for the Japanese firms renewing their efforts in the U.S. market, there's nothing in their individual product lineups, strategies, or distribution schemes that suggests they'll push aside the currently established players in short order. Any new player's best chance at gaining quick market share is to buy it by being the price leader. Unfortunately, it's a tactic several current leaders have perfected—in many cases to their own financial dismay. So it's unlikely the Japanese firms will go that route.

The bottom line? Look for it to take at least several years before any of these firms climb to the top of the heap.

It's a Sony—PC

Targeting the home market.

Sony Corp. reentered the personal computer business in June when it introduced the PC by Sony home computer, a high-end machine priced between $2,000 and $3,000, without a monitor. Sony expects to ship the first Windows 95 machines to consumer-electronics retailers such as Best Buy the first week of August.

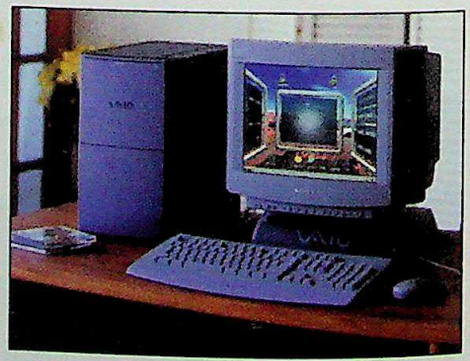
In returning to the market (12 years ago, Sony introduced the first PC with a 3.5-inch floppy disk drive), Sony is setting its direction for the next 50 years, says Takashi Sugiyama, director of marketing for PC products for Sony Information Technologies of America, a new U.S.-based arm of the electronics and entertainment giant.

Inside Sony's new PC, you'll find a 166-MHz or 200-MHz Intel Pentium processor, a 2.1GB or 2.5GB hard disk, 16MB of RAM, an ATI 3-D accelerator with 2MB of video RAM, a software-based MPEG 1 decoder, a Sony 8X CD-ROM drive, and a Sony 28.8-Kbps modem for simultaneous voice and data. Sony has also outfitted the motherboard with a Universal Serial Bus (USB) connector for the easy hookup of peripherals.

The monitor is the key differentiator, says Sugiyama. The 15-inch Sony-made monitor (a 17-inch model will be available next year) has a microphone, a subwoofer in its base, a full-duplex speakerphone, and SRS 3-D sound.

Sony's plans are twofold: to give home users a fantastic computer-based video and sound experience and, perhaps more strategic, to create synergy between its consumer-electronics and computer businesses.

"We see the opportunity to expand the peripheral business," says Sugiyama. In fact, every division of the company is looking into converging consumer electronics with information technology, making TVs, VCRs, camcorders, and stereos work with PCs.



VERY VAIO: *Sony spotlights video and audio.*

"Sony clearly has the intention of having a multiple product line," says IDC/Link's Walter Miao. "They've got an excellent strategy," he says of Sony's USB plans, "that's more in concert with the consumer-electronics approach." Sony has introduced a USB-based 100-CD changer that stacks on top of the Sony PC's mini-tower. Sony has also introduced the PC Vision Touch, a USB receiver for remote control of Sony products.

Despite today's cutthroat market, Sony thinks its timing couldn't be better. Nearly half of all new PCs are bought for the home, Sony has strong brand equity, and Sony sees the integration of audio, visual, computers, and communications—what it calls VAIO, for Video Audio Integrated Operations—as a natural extension of home entertainment systems.—*Carol Levin*

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First Looks

HANDS ON REVIEWS OF NEW SHIPPING PRODUCTS

WEB BROWSER ADD-ONS

Off-Line Readers Deliver the World of the Web to Your Hard Disk

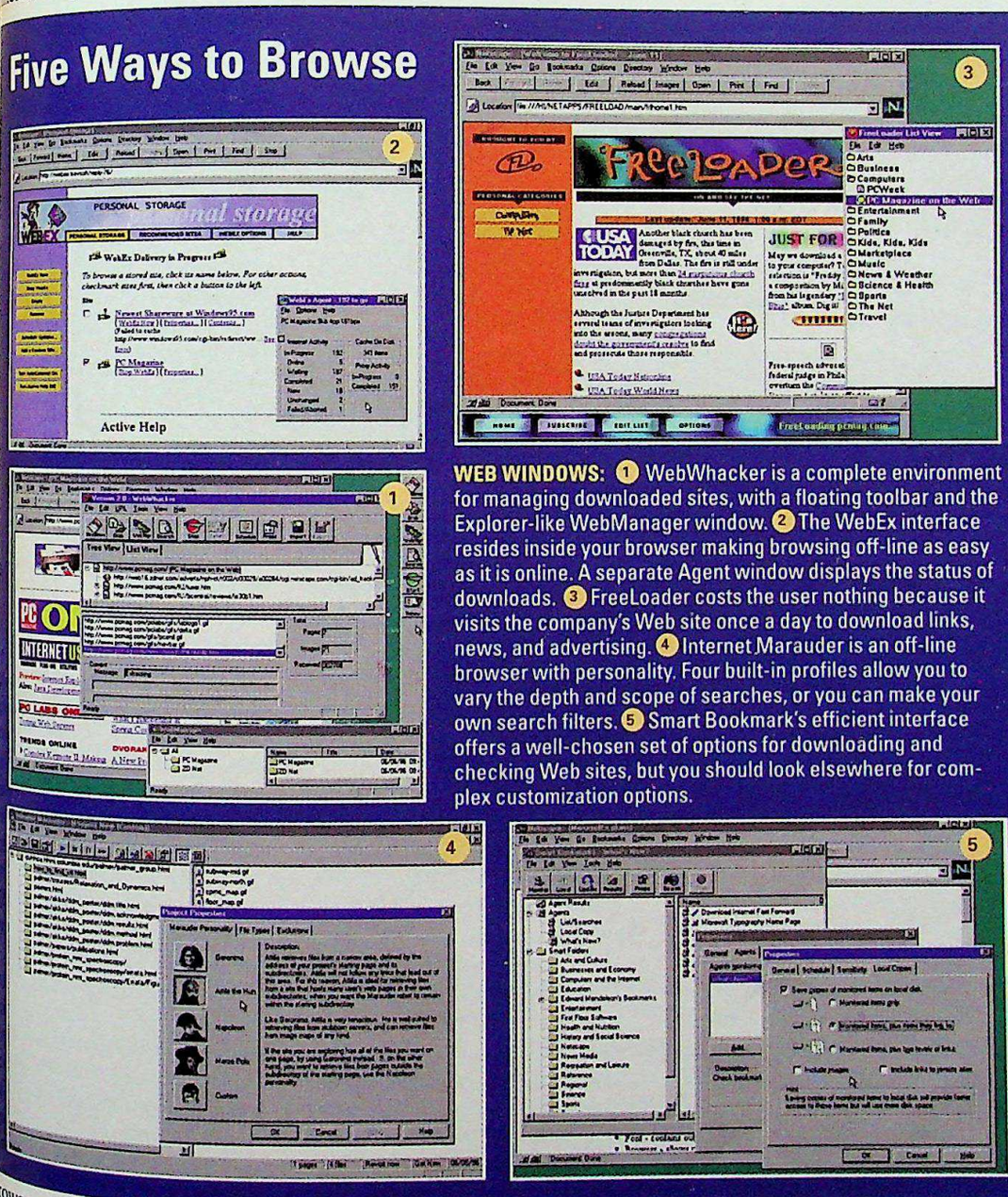
By Edward Mendelson

Off-line readers are utilities that download a World Wide Web site—complete with links and graphics—from the Internet to your disk so you can browse through it even when you're not connected to the Net. After downloading all or part of a Web site, you can browse the local copy of the site at hard disk speed at your leisure. This new class of software not only makes the Web more portable, but it can save you online connection charges by transferring only what you want.

In general, using these utilities is simple: Enter the URL of the Web page where you want to start and specify whether to capture linked pages and graphics. Option settings let you save linked pages one or more levels away from the starting page and let you decide whether the programs should pursue links outside the domain of the starting page. The five programs we reviewed—FreeLoader, Internet Marauder, Smart Bookmarks, WebEx, and WebWhacker—rank among the most innovative and powerful off-line readers. Comparable programs that you can find on the Internet include Metz Software's Metz Netriever (*http://www.metz.com*), Tympani Development's NetAttaché (*http://www.tympani.com*), and Open Market's OM-Express (*http://www.openmarket.com*).

Of these five, Freeloader is the easiest, WebWhacker is the most complete, and the other three lie somewhere in between.

Five Ways to Browse



WEB WINDOWS: 1 WebWhacker is a complete environment for managing downloaded sites, with a floating toolbar and the Explorer-like WebManager window. 2 The WebEx interface resides inside your browser making browsing off-line as easy as it is online. A separate Agent window displays the status of downloads. 3 FreeLoader costs the user nothing because it visits the company's Web site once a day to download links, news, and advertising. 4 Internet Marauder is an off-line browser with personality. Four built-in profiles allow you to vary the depth and scope of searches, or you can make your own search filters. 5 Smart Bookmark's efficient interface offers a well-chosen set of options for downloading and checking Web sites, but you should look elsewhere for complex customization options.

FREELOADER

FreeLoader 1.0 costs nothing because advertisers pay for the chance to hawk their wares while you use it. FreeLoader copies individual pages and entire sites to your disk on command or based on a schedule. It lets you view the sites in Netscape Navigator but not in other browsers.

The price you pay for this convenience is that once a day—whether you want it or not—the program downloads and displays a page of news, links, and advertisements from FreeLoader Inc.'s Web site. You can download any of FreeLoader's preselected sites or select your own, but you must use the program's 14 built-in categories. The next version will let you create categories of your own.

Downloaded pages are stored in FreeLoader's disk cache and can only be saved to other directories by opening and saving each page in Navigator. The program uses DDE to communicate with the browser, but an option to set FreeLoader up to work as a proxy server is due. Compared with its rivals, FreeLoader is easy to use, and the price is right, but those relentless ads get old.

FreeLoader 1.0. List price: Free. Requires: 8MB RAM, 4MB hard disk space, Microsoft Windows 3.x or later, Netscape Navigator 1.1 or later. FreeLoader Inc., Washington, DC; http://www.freeloader.net. *(No Indian Partner.)*

INTERNET MARAUDER

Unlike most off-line readers, Bourbon Street Software's $10

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Internet Marauder 1.4 downloads only the specific file types that you select. When you only want a list of the files linked to a particular page or site without downloading the content, Internet Marauder can do that too.

The program lets you limit a search to links from a single page, on a single domain, or to one level outside the domain of the starting page. When you launch Internet Marauder, a wizard lets you set search options. The program includes four built-in search robots—Attila the Hun, Geronimo, Marco Polo, and Napoleon—which explore pages at varying distances from the starting page. You can also create a filter based on the built-in list of file types or produce your own. If you choose to create a custom-search robot, you can decide whether to download or ignore image maps, or even ignore embedded graphics altogether.

Internet Marauder's main window looks like the Windows Explorer interface. The right panel displays a list of remote files as they are downloaded to your disk, while the left panel displays a directory of the Web pages linked to the starting page. The current version does not allow you to alter the file list, but a future version will be configurable.

Internet Marauder won't set any speed records, but it's well suited to conducting unattended searches. Internet Marauder Pro, a faster, multithreaded $30 version with support for password-restricted Web sites and the ability to limit downloads by file size, should be ready soon.

Neither version includes scheduling, but both help you find what you're looking for and then get out of the way.

Internet Marauder 1.4. List price: $10. Requires: 8MB RAM, 1MB hard disk space, Microsoft Windows 95 or Windows NT. Bourbon Street Software, New Orleans, LA; http://wymple.gs.net/~bourbon/index.htm.
(No Indian partner.)

SMART BOOKMARKS

FirstFloor's $25 Smart Bookmarks 2.0 was designed primarily to alert you to changes in Web pages, but you can also use it as a bare-bones off-line browser. The program, available either through FirstFloor or as a part of Netscape's $49.95 PowerPack, lets you choose simply to be notified of changes in remote sites or to have these modified pages downloaded for later viewing. In addition to performing these tasks on command, the program lets you schedule updates or downloads at regular intervals.

You'll need your browser to view downloaded pages, but Smart Bookmarks can do its work without the browser running. All pages are stored in Smart Bookmark's disk cache, and you save them elsewhere on your disk by opening them in your browser and saving each file by hand.

The unobtrusive interface consists of an Explorer-style window with a directory of folders on the left and the names of individual sites on the right. When you click on a site, your browser is automatically launched and the page opened.

Smart Bookmarks is small and unobtrusive, and it may be the reader you use most often.

Smart Bookmarks 2.0. List price: $25. Requires Windows 3.1 or later, any standard browser. FirstFloor, Mountain View, CA; http://www.firstfloor.com.
(No Indian partner.)

WEBEX

Traveling Software's $29.95 WebEx is an efficient off-line reader and the only program of its kind that works almost entirely inside your browser. Although this approach reduces interface overload, the non-standard menu structure and toolbars that WebEx inserts in the familiar browser window take some getting used to.

When you see something you want, click a button on the WebEx toolbar. An options page appears in which you specify the depth of the search and the types of elements to save (text, graphics, or multimedia files). You can also choose whether to cache the pages immediately or schedule an unattended download.

Launch WebEx and an Agent window appears on your screen and tells you whether any downloads are scheduled. From this window you can launch either Internet Explorer or Navigator, which automatically configure the Agent as a proxy server. Be warned that if you launch FirstFloor's Smart Bookmarks while using WebEx, Smart Bookmarks adapts itself to the new proxy-server setting and won't work when you try to run it again—unless WebEx is also running.

WebEx's HTML-based forms allow you to set preferences for downloading and scheduling, and optionally to limit the download to a specified size, and then check off the sites you want to save. One bonus is that you can use your browser—albeit slowly—while WebEx downloads in the background. When you select a downloaded site to view, WebEx generates a table of contents that lists either all pages on the site or only those unread.

Unfortunately, WebEx won't work unless you have graphics turned on in your browser—a real inconvenience for dial-up users. And you can't tell the program where to store a Web site; the program stores all pages under arbitrary names in its own directory. But if you can live with these glitches, you'll find WebEx a fast, reliable, and effective Web surfing companion.

WebEx. List price: $29.95. Requires: 12MB RAM, 10MB hard disk space, Microsoft Windows 95. Traveling Software, Bothell WA; http://www.travsoft.com.
(Indian partners Infomart, Bangalore; Optime SW, Hyderabad.)

WEBWHACKER

WebWhacker 2.0 is more than a off-line reader—it's an environment, complete with toolbars, search tools, and utilities for finding and downloading pages.

The $49.95 package from the ForeFront Group places WebWhacker's toolbar at the edge of your screen. You then launch your browser, and when you find a site you want to save, click on the Grab button. WebWhacker's Subscription Wizard pops up with the page's URL already filled in. A window in the Wizard displays the WebManager catalog—a directory of saved sites—and you can select where to store new ones.

A succession of dialog boxes allow you to specify how many levels you want to retrieve and to schedule periodic updates. WebWhacker's main window then opens, and you click on the Start button to begin downloading. A status window displays the progress of the download, and as the pages are copied to your disk their addresses are added to a tree diagram in a second window.

When you want to read a page, you click on its address in the directory and its contents appear in your browser window. Pages are stored in a single file that only WebWhacker can read, but an Export button lets you save sites or pages to the directory of your choice.

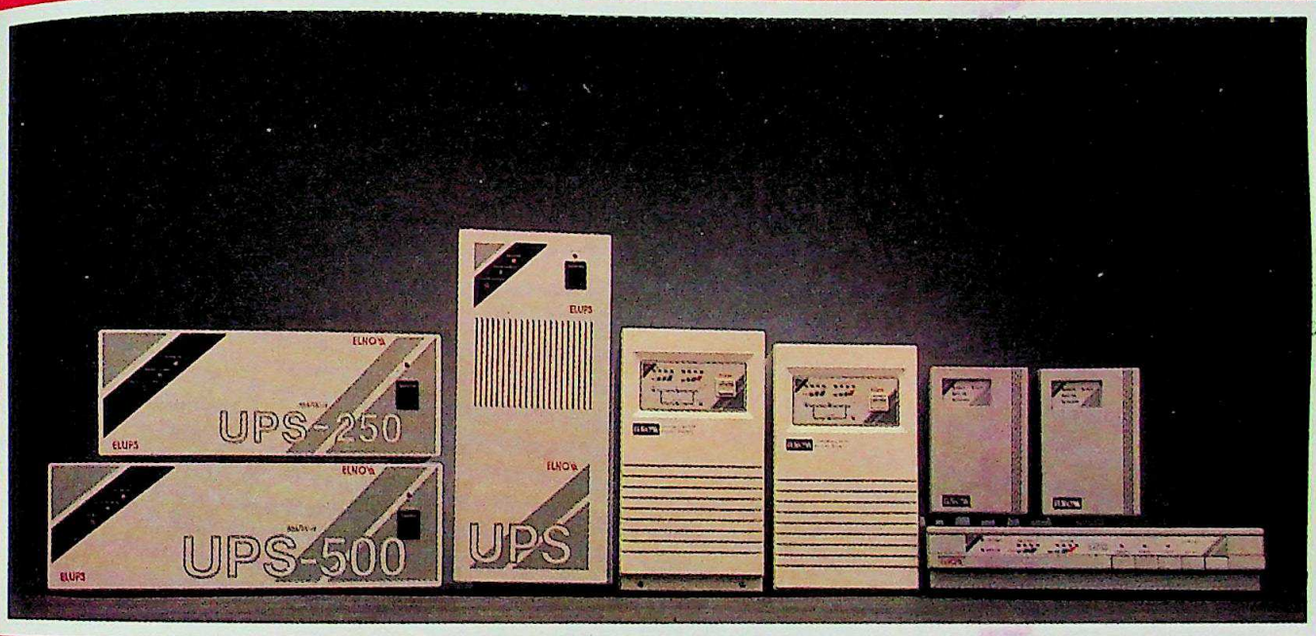
We had to change the proxy-server settings by hand, but the ForeFront Group promises that an update will automatically configure these settings, so your browser will work normally if you run it without WebWhacker. With its impressive search and organization features, WebWhacker is one of the best ways to get the most out of Web sessions.

WebWhacker 2.0. List price: $49.95. Requires: 4MB RAM, 1MB hard disk space, Microsoft Windows 95 or Windows NT. ForeFront Group, Houston, TX; http:// www.ffg.com.
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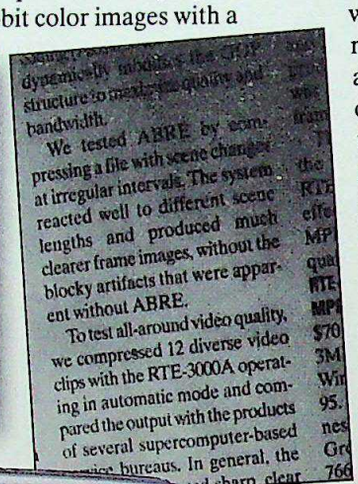
DIGITAL PHOTOGRAPHY

Canon PowerShot 600: A Point-and-Shoot Camera with Some Professional Features

By Daniel Grotta and Sally Wiener Grotta

Canon's $949 PowerShot 600 is a conventional-looking, deceptively simple, point-and-shoot camera that offers an impressive array of technological advances and features unheard of in entry-level filmless cameras.





POINT-AND-SHOOT PLUS: *Canon packs impressive features into the PowerShot's deceptively simple case. Switch to B/W Text mode and the camera becomes a 300-dpi handheld gray-scale scanner.*



The PowerShot does not allow the manual setting of shutter speed or aperture, but its autofocus lens lets you get as close as 4 inches to the subject by using the camera's macro mode. The built-in strobe flash illuminates from as far away as 12 feet, about twice the distance of most entry-level filmless cameras. In addition, the strobe preflashes, virtually eliminating red-eye in portraits.

Among the PowerShot's other conventional features are three-stop exposure compensation; a self-timer; automatic white balance; frosted view frames; an interchangeable nickel cadmium battery pack; the ability to erase the last frame or all frames conveniently; and a time, date, and data stamp.

HIGH-RES CAMERA

The PowerShot's 570,000-pixel charge couple device target produces 24-bit color images with a resolution of 832 by 608 pixels—the highest of any digital camera that sells for under $3,500. There is a trio of user-selectable levels of image compression: Fine, Normal, and Economy. Most users will find the Fine mode suitable for the majority of situations.

Each Fine image occupies 150K to 180K in the camera—depending upon the complexity of the subject—and decompresses to a 1.48MB JPEG file. The PowerShot's 7.5-mm, f2.5 lens, which covers a field of view equivalent to a standard 50-mm focal length lens on a 35-mm camera, exhibits better edge-to-edge sharpness than other cameras in its class.

In addition to capturing color images, the PowerShot can be switched to a B/W Text mode, which when combined with the macro setting makes for an excellent handheld gray-scale scanner with a resolution of 300 dots per inch. We were able to capture readable text as small as 10 point and from as close as 4 inches, but the image quality was not good enough for optical character recognition. There's a view frame for shooting business cards that works quite well.

The PowerShot is the first entry-level filmless camera that permits audio annotation. The camera has a built-in microphone and saves the sound messages as .WAV files. You can record a variety of sounds, such as bird calls that go with photos of birds, but the audio quality is often disappointing, and capacity is tightly limited.

In addition to 1MB of built-in flash memory, the PowerShot can accommodate standard ATA-format PC Cards—Type I, II, or III—which can be inserted into any laptop or desktop PC Card drive. Canon offers an optional $229 4MB flash card and a $380 170MB hard disk card for the camera. In Fine mode, the flash card can store 18 images, and the hard disk card can hold an impressive 900 ima-ges. We enjoyed shooting with the Power-Shot and 170MB hard disk card because we weren't constrained by limited image-storage capacity.

Our tests revealed that performance differences between the flash card and the hard disk card were not significant: Acquisition time was 1.5 seconds for the flash card and 1.75 seconds for the hard disk card. But we recommend the hard disk card, because it costs much less on a per-image basis.

Images may be transferred to your PC by sliding the camera into its interface/charge cradle, which plugs into the PC's parallel port. By contrast, most entry-level filmless cameras plug into the slower serial port. Oddly enough, the camera must be turned off when cradled to operate properly. On average, it took 9.8 seconds to transfer a Fine mode image.

IN FOCUS

Canon boasts that the PowerShot is the only filmless camera under $10,000 to use a three-zone focus system to obtain sharper, more accurate pictures. Unfortunately, the servo motor and focusing infrared beam take up to a second and a half to focus. This delay made it virtually impossible to get a good snapshot at a sporting event. We were able to reduce the delay time by depressing the shutter halfway to activate the autofocus, but the delay is still far too long for most situations.

To achieve edge-to-edge sharpness, Canon elected to use a fixed focal length lens that can't zoom in on the subject. The company sells a useful and well-designed $99 auxiliary wide angle lens, however; it slips over the lens and viewfinder, giving the user an ac-curate view of the widened coverage.

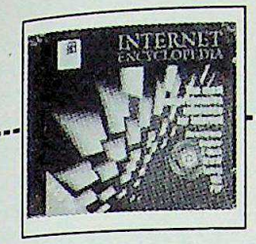
The PowerShot 600's image quality is the best we've seen so far in entry-level cameras, and its features will raise the bar for the competition.

PowerShot 600. List price: $949. Requires: PC with parallel port. Canon Computer Systems Inc., Costa Mesa, CA; http://www.ccsi.canon.com. *(Indian partner Network, New Delhi.)*

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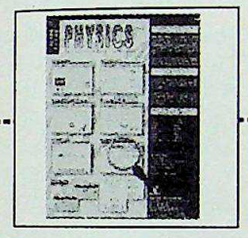
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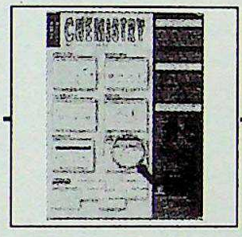
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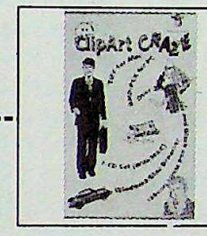
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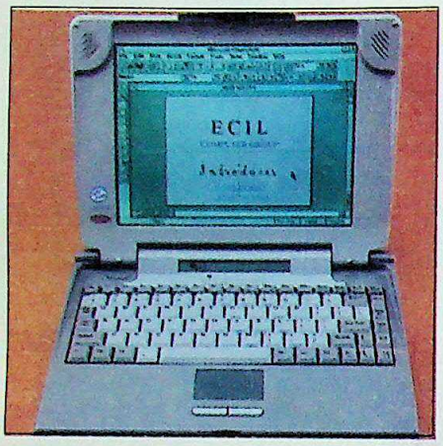
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Executive Pentium Notebook. *ECIL, Post Office Hyderabad 500 762, Tel: 620131, Fax: 91-842-621897.*

MOSAIC

Multilingual Page Designing SW from Abacus

Bombay-based Abacus Computers has announced 'Mosaic,' a multilingual page designing software on Windows, which, the company claims, is functionally superior to PageMaker and QuarkXpress.

Some prominent features are discussed here.

Dual (two) default setup at a time: You can set up all the parameters for English as well as Devnagari. For instance, if you have a job to be composed in English and Devnagari, in all other packages you have to change the parameters as and when the language changes. In Mosaic, you need not do this. Thus it helps to increase your production.

Changing of language: A toggle key has been provided to change the languages. This saves your time. Otherwise it is cumbersome to drag your mouse to 'Type' to change the languages.

Tabulation: All the tab endings are done automatically (word warp at the end of the tab measure). You can set each tab in different point sizes and different fonts. This means when you operate a tabulation job, you need not go on changing the point sizes or fonts. It is done automatically.

Automatic flow: You define the columns and depth of your page. The matter flows automatically.

Fit element: You have a specified width, you have to fit a heading, you need not worry about selecting the point size or whether to condense/expand. It is done automatically.

Multilingual Page Designing. *Plot No. 1, Compd No.1, Marol Co-Op. Industrial Estate, Andheri (East), Mumbai 400059. Tel: 8509416/8500986; Fax: 8508112.*

ARCHITECTURAL SW

New Design Solutions from Autodesk

Autodesk has unveiled several new design solutions. Announcements included the Autodesk AEC Professional Suite, Inside Track for architectural design and drafting, the beta version of its Whip! plug-In, Autodesk View 1.1. Autodesk's Kinetix division's Max DWG plug-in for 3D Studio Max, and the intention to acquire CadZooks, Inc. and its Reality Check software.

Autodesk is making a first step toward AEC. Autodesk AEC Professional Suite lowers the cost of a complete AEC design solution for customers. The product set is comprised of Auto CAD Release 13, AutoCAD Release 12 (to assure flexibility for any user's hardware and operating system platforms), Auto Vision 2.0 Autodesk Architectural Symbols and Autodesk View software. AEC Professional Suite also includes more than 25 coupons for selected free software or discounts of up to 50% off Autodesk's AutoCAD Data Extension, 3D Studio, and other selected Autodesk third-party software applications.

Also new to the market is InsideTrack for Architectural Design and Drafting, an award-winning technology that gives multimedia-based, interactive learning capabilities to AutoCAD users. Through a blend of animation. narration and direct interaction with Autodesk products, Inside Track provides learners with the right amount of training for the user's learning style and ability. Inside Track, developed by Autodesk Press, applies to the real world, with practical answers to everyday problems and challenges in AEC firms today. AutoCAD or other Autodesk software is not required to use Inside Track.

The Beta version of the Autodesk Whip! Plug-In, which combines Autodesk's new DWF 2D vector file format with a viewer for use with Internet browsers, is now available on the Internet (www.autodesk.com) to AutoCAD R13 customers. The Whip! Plug-In originally available in April in prototype version. has been updated to support the Microsoft Internet Explorer browser and includes new performance features and printing capabilities. Together, the Whip! Plug-In and the .DWF file format provide dynamic panning and zooming for complex design graphics. The Whip! Plug-in Internet Utilities let users of the latest version of AutoCAD Release 13 (c4), publish their drawings in a new compressed file format drawing web format (.DWF), designed specifically for the Internet.

Kinetix, Autodesk's multimedia business unit, introduced a plug-in for 3D Studio Max that lets users of the 3D modeling and animation package read .DWG format files created in AutoCAD. Available free of charge, the Max DWG Plug-In dramatically simplifies the process of exporting 2D and 3D AutoCAD files into 3D Studio Max while retaining the original drawing information and organization. Max DWG gives designers and animators easy access to millions of AutoCAD drawings, providing them with accurate templates for building realistic, three-dimensional models in 3D Studio Max.

Autodesk's Designer's Vision product was recently acquired continues its commitment to offer the best viewing technology available for AutoCAD. Autodesk View 1.1 now runs on Windows Nt and Windows 95 and supports the AutoCAD Release 13 advanced features of ACIS 3D solid model objects creation, complex line styles, MLINE capabilities and MTEXT features. In addition to accessing Autodesk's .DWG file format. Autodesk View also reads over 150 common business file formats.

AEC Professional Suite. *Hope Soft Systems, Software Technology Park, P B No. 5517, Bakery Jn, Trivandrum 695034. Neil Automation Technology Ltd. 1201/c/4 Shivtirth F C Road, Shivajinagar, Pune 411044. Tel: 321443; Fax: 368032.*

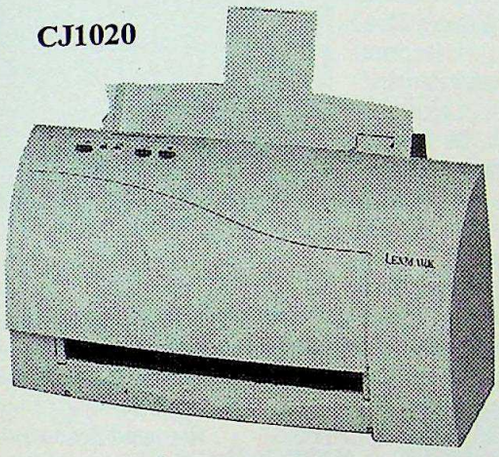
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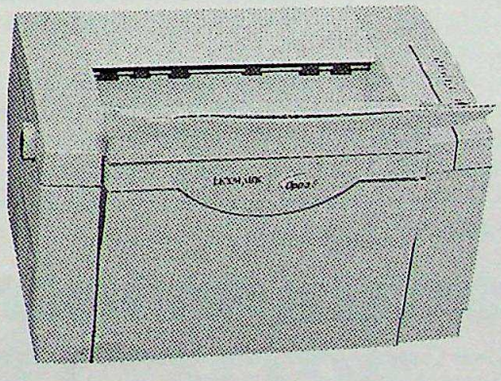
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MULTIDIMENSIONAL MODELLING

Seagate Announces Business Intelligence Software

Seagate Software has announced the availability of version 5.0 of its Holos Business Intelligence software. Holos is a comprehensive application development environment for Enterprise Business Intelligence systems, enabling users throughout an organization to access, analyze, perform multidimensional modeling, and report on data from data warehouses and/or directly from operational systems.

Holos 5.0 has been specially designed to implement Enterprise Business Intelligence, which advocates an all-encompassing ("holistic") view of an organization's business needs to leverage corporate data for maximum return. The Enterprise Business Intelligence approach starts with the elements that drive the business itself, and extends to the way in which the Business Intelligence system is developed and implemented, including leveraging the existing IT infrastructure. Holos 5.0 systematically delivers the right information to the right people across the organization at the right time. In the course of doing this, it supports the workflow of the customers business processes (either existing or re-engineered) and produces a competitive advantage for the organization.

Features of Holos 5.0 include:

- true data mining capability, implemented via neural network technology, and executed as a scamless, embedded feature within Holos;
- the availability of intelligent agents background processes set up by the user to monitor events, announce exception conditions, and so on;
- Holos for Windows NT client and server can be configured to run on a single desktop or a portable PC;
- an enhanced end-user environment, with an emphasis on object-oriented drag-and-drop application development, shortening the learning curve and providing greater flexibility and efficiency;
- closer integration and support for popular electronic mail systems, Lotus Notes, Excel, and Lotus spreadsheets;
- tight integration with all popular relational databases, and availability for most Unix, VAX/Alpha VMS, and NT servers, with native Windows. Windows NT, and Macintosh desktops.

Holos Business Intelligence 5. *ACI Infotech, 146 Maker Chamber VI, 13th Floor, Nariman Point, Bombay 400021.*

LOW-POWER CARD

Nokia Launches Digital Cellular Data Card

Nokia Mobile Phones (Japan) K.K. has introduced the Nokia DigitalData/Fax card. The card enables wireless data transmission linking Nokia's digital mobile phones and portable computers with the PCMCIA slot. This credit-card sized, compact devise enables the sending and receiving of e-mail, faxes, and data files. It also offers access to public information services, such as the Internet.

The card, which complies with Japanese digital standards (PDC), consumes less power than other data cards (200mW, 15mW during stand-by operation), claims the company. The retail price is Yen 29,800 including software and delivery cost. This includes 'EasyFax Lite' for Nokia, an application developed for this product by A.I. Soft, which supports class 2 ECM.

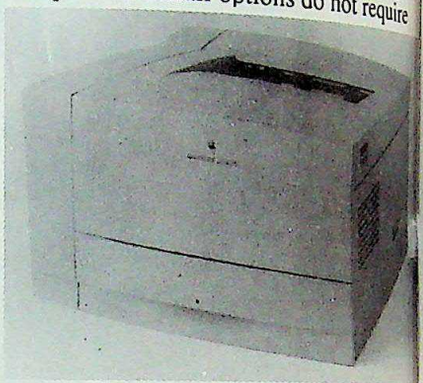
Sales of this product will be directly handled by Nokia Mobile Phones (Japan) K.K.

Digital Data/Fax Card. *Nokia Mobile Phones, 14th Floor, International Trade Tower, Nehru Place, New Delhi 110019.*

LASER PRINTING SOLUTION

Apple's Multi-Platform Printer

Apple computer has announced a new multi-platform workgroup laser printing solution for users of Mac OS, Windows, and Unix systems. The Apple LaserWriter 12/640 PS is aimed at cross-platform workgroup in segments such as business, government, and education. The new LaserWriter offers what is claimed to be exceptional print quality, extensive media handling capabilities, and built-in networking capability.



The company claims that LaserWriter 12/640 PS is Apple's laser printing solution for demanding small workgroup environments. Its flexible paper handling options, extensive networking support, and Adobe postscript and PCL printer language capability make it a natural choice for Mac OS, Windows, and Unix users.

Among the system features are:

- 600 by 600 dots per inch resolution at 12 pages per minute;
- media handling capabilities;
- a 250 sheet universal cassette and a 80 sheet multi purpose tray;
- A4 to postcard, transparencies and lables;
- supports paper weights from 16-50 pounds;
- supports industry-standard network protocols EtherTalk, TCP/IP, and Novell Netware IPX;
- offers Adobe postscript Level 2 and PCL capability for compatibility with cross-platform applications;
- Adobe Type manager for Mac OS and Windows gives users true WYSIWYG from screen to output.

The system provides many options. The LaserWriter 12/640 PS supports flexible paper handling options to meet differing user requirements. These easy-to-install options do not require any tools. Options include:

- duplex printing unit option which permits professional double-sided printing without the need for a copy machine;
- a 500 sheet cassette and feeder for large workgroups;
- an envelope cassette that handles a variety of envelope sizes and postcards;
- a face-up output tray option that takes advantage of a unique straight-through paper path capability which facilitates printing on transparencies, and so on.

LaserWriter 12/640 PS. *Apple Computer International, 5th Floor, Du Parc Trinity, 17 M.G. Road, Bangalore 560001. Tel: 80509/2646, 5550575.*

WEBSITE

Ramakrishna Mission on the Web

Dias Infotech has hosted a Web page for Ramakrishna Mission, the socio-religious organization. This venture is the first of its kind in India. Swami Lokeswarananda released the Web site at Calcutta. It provides information about the mission's activities and services offered by them, Situated at http://www.diastech.com/rkmission on the I-way, this site can be accessed globally. The Webpage will also contain addresses of different centers of Ramakrishna Mission.

Website. *Dias Infotech, SDF Building, Block GP, Sector V, Bidhan Nagar, Calcutta 700091. Tel: 9133337; Fax: 9133321.*

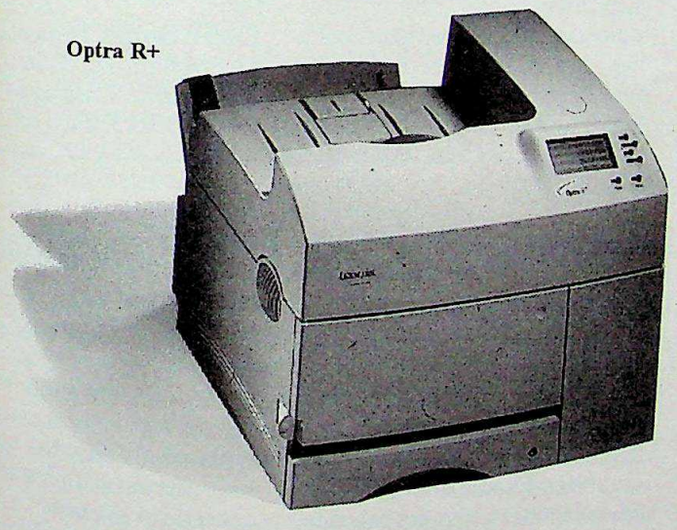
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NETWORKING DEVICES

ISDN Bridge/Routers from Bay

Bay Networks has announced a new range of small office ISDN routers with JATE (Japan Approvals Institute of Telecommunications Equipment) approvals to target the growing Japanese remote connectivity market.

Bay Network Clam bridge/router range provides solutions for remote office users who require high performance Wan connectivity at an affordable price. The company claims that the Clam is a small, highly portable, external unit that provides advanced routing for TCP/IP, Novell IPX, as well as transparent intelligent bridging for Windows NT and Banyan Vines, and non-routable protocols. The Clam offers 2 x 64 Kbps basic rate ISDN channels, optional support via a serial line card for leased line or frame relay operation and an analog port for combined telephone/fax connections across ISDN.

Offering connect times at under one second, ISDN can readily be used for real-time routing, rather than just occasional dial-up access. Capable of data link speeds up to 512 Kbps and making efficient use of data compression to reduce transmission costs, the Clam provides effective remote access for small branch offices and workgroups to the corporate network and the Internet. Bay Networks' ISDN routers use optimised routing techniques to ensure the quickest route is always used for fast and responsive connection times.

Several advanced security options are offered by the Clam, including filtering by network address, and Calling Line Identification (CLI) which verifies the incoming ISDN call prior to access.

An integrated SNMP management tool allows all the routing functions to be easily configured using menu-based systems, and a great strength of the whole range is their ease of installation with self-learning options greatly reducing management overheads.

ISDN Bridge/Routers. *Bay Networks Company, Featherstone Road, Wolverton Mill, Molton Keynes MK 12 5RD, UK. Fax: +44 (0) 1908222115.*

BROADBAND PRODUCTS

N/W Products from Scientific-Atlanta

Scientific-Atlanta has introduced two new subscriber drop products, the Multimedia Stretch Tap and the 1 GHz Drop Amplifier for broadband networks. The Stretch Tap provides broadband networks with improved RF performance, power-passing capacity, easier installation and maintenance, as well as the flexibility to power future telephony applications. The 1 GHz Drop Amplifier provides the local drop amplification and splitting capability desired for the growing number of interactive services in broadband system.

The benefits of the Multimedia Stretch Tap include the ability to pass 12 amperes, which meets broadband network's increased current needs for centrally-powered telephony applications and port powering that enables the operation of customer-premised telephone equipment.

A patented AC bypass coil significantly suppresses hum modulation in the network, especially important in telephony networks where high current is present, while Scientific-Atlanta's existing non-interruptible bypass technology allows the tap faceplate to be removed without causing service interruptions upstream or downstream. The company believes a need to increase signal strength in the home with the delivery of data, telephony, and advanced video services through additional outlets.

Multimedia Stretch Tap, Drop Amplifier. *Scientific-Atlanta: (852) 22525059.*

GRAPHICS DEVICES

Digital Launches Encad Output Devices

The Mumbai-based Digital Electronics has launched Encad's family of large-format graphics output devices.

Novajet 4
Novajet 4 is the next step in Encad's commitment to the graphics professional and sophisticated CAD user. It can plot anything from line drawings to 3-D renderings to photorealistic images. Offering the convenience of refillable ink cartridges, Novajet 4 is designed for anyone in need of high quality color images.

Novajet Pro
Designed for professional graphic artists and production volume users, the Novajet Pro has a huge 500 ml continuous-flow ink system. So you don't have to worry about ink cartridges running dry in the middle of the job.

Novajet Pro 50
Novajet Pro 50 has 50" carriage, and offers a high quality, large color output, claimed to be much superior in its price range. To further enhance productivity, all Novajet Pro 50 plotters come equipped with an automatic media feed and take-up system that allows for virtually unattended plotting.

NovaZoom
The Encad NovaZoom is a sophisticated scan-to-print module that enables you to transform images from wallet size to wall size. Simply scan any image and print it to your Novajet plotter. You don't even need a computer or a RIP.

Plotting utilities
Encad offers software drivers for PC and Macintosh to ensure repeatable results and the best color calibrations throughout the printing process.

Novajet Pro RIP
The Encad Onyx qube is a hardware PostScript Level 2 Raster Image Processor (RIP) created especially for the Novajet pro 50 plotter, for Macintosh applications.

Encad Output Devices. *Digital Electronics, 74/11 Cross Road, MIDC, Marol, Mumbai 400093. Tel: 8360225; Fax: 8350150.*

TOOLBOX

Financial Package from MathWorks

The MathWorks Inc., USA, has launched the Financial Toolbox, for financial analysis, modelling, and development of full scale applications. It analyzes risks, optimises portfolios and price financial instruments, and evaluates hedging strategies. The software focuses on financial institution in order to increase the productivity of financial professionals.

The company claims that financial analyst can use Matlab, to perform real-time technical analysis on hundreds of derivative prices minute-by-minute, as the data streams in from all over the world. It supports a wide variety of hardware/software systems like 486DX2 or Pentium PCs, Macintosh, SunSparc, DEC-RISC, DEC-Alpha AXP, SGI, HP9000, IBM RS/6000, DEC VAX Systems, letting you combine and compute several gigabytes of data. Users of MS-Windows, X-Windows and Macintosh platform can transfer applications and data transparently without modifications from machine to machine.

Applix and Excel-Link integrates the numerical and graphical power of Matlab with the accessibility of spreadsheet, word processing, and macro processing tools. It lets you exchange and synchronize data between the two environments and is specially used for analysing and visualising real-time data from financial markets.

Financial Toolbox. *Cranes Software International (P) Ltd, # 5 Domlur Layout (Service Road), Airport Road, Bangalore 560071. Tel: 5549338.*

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MICHAEL J. MILLER

Exploiting the Intranet

Remember local area networks? Client/server computing? They were all the rage a few years back. Nowadays, local area networks aren't so local anymore. In any medium or large company, the network is likely tied to other networks and to the Internet and can be accessed remotely. And while the client/server concept sounded good, it didn't always work as advertised. Applications were difficult to develop and integrate with one another, and it was hard to connect internal applications with clients outside the network.

Today the buzzword is *intranet,* the concept of using Internet standards on networks to create open—but incredibly capable—applications. Netscape, Microsoft, and Lotus all recently announced their own intranet strategies, but they use such different languages, it's hard to tell whether any one company really sees the whole picture. Netscape is adding more network and groupware features to an Internet framework. Microsoft is integrating Internet features into existing operating systems and applications. And Lotus is taking its groupware standard and building in new Internet features.



PHOTOGRAPH BY ANDY FREEBERG

THE INTRANET IDEA

Today the buzzword is *intranet,* the concept of using Internet standards on networks.

Currently, Netscape is leading the intranet bandwagon. The company wants to turn your internal network into what it calls a "full-service intranet." This model would use open standards to provide information sharing and management, communication and collaboration, navigation and access to applications, as well as the four major network services—directory, replication, security, and management.

Netscape's plan includes new versions of its Navigator browser (code-named Galileo and due by year's end), with real discussion groups, secure e-mail, off-line e-mail functionality, new layout and forms features, and enhanced Java support. Orion, the next generation of SuiteSpot servers (slated for rollout in 1997), will add directory and replication services, agents, improved security, and more advanced application development and management. All of this is designed to create an "Internet OS" to challenge traditional groupware products such as Notes and network operating systems.

Microsoft has responded by repositioning the bulk of its line as intranet products. A planned update to Internet Explorer will include a new feature called Active Desktop that will enable you to view local files as though they were part of the Internet, with HTML pages showing what's in each directory. By using this method to view files seamlessly across local hard disks, servers, and the Internet, Internet Explorer 4.0 promises to make navigating and working with documents easier than ever.

More surprising are Microsoft's plans to integrate its Office 97 applications with its intranet products, so you'll be able to view documents created with Excel or Word, for example, within your browser. You can even edit the document within the browser. At this point, we don't know how well this integration will really work, but it sure sounds cool.

While Netscape and Microsoft are making lots of noise, Lotus is quietly making a strong case that a lot of the new features the others are pushing—e-mail integration, replication, better security—have long been part of Lotus Notes. All the same, Lotus has been adding Internet features to its workgroup platform. A new version of Notes called Domino lets you use any Web browser to get complete access to all the data on Notes servers while maintaining Notes's built-in design, security, and replication features. Any Notes database will effectively become a series of Web pages.

Lotus is working on new versions of its clients and servers that will add features such as group scheduling and support for more Internet mail and security standards. One such server, Domino II, will be completely based on Internet standards for formatting, mail, and security. Lotus is also showing Net.Apps, a series of applications built on top of Notes and designed for setting up Web sites, as well as Components, Lotus's applets for performing specific tasks within the Notes environment.

Can any of these vendors deliver? Right now, we don't know. Netscape has lots of experience with Web servers, but not with groupware or network operating systems. Microsoft knows operating systems, but most sites are designed for Navigator, not Internet Explorer. And while Lotus Notes has the features, it lacks the mind share of pure Internet-based solutions. None of these solutions are likely to be complete, but they point the way toward a more integrated solution. □

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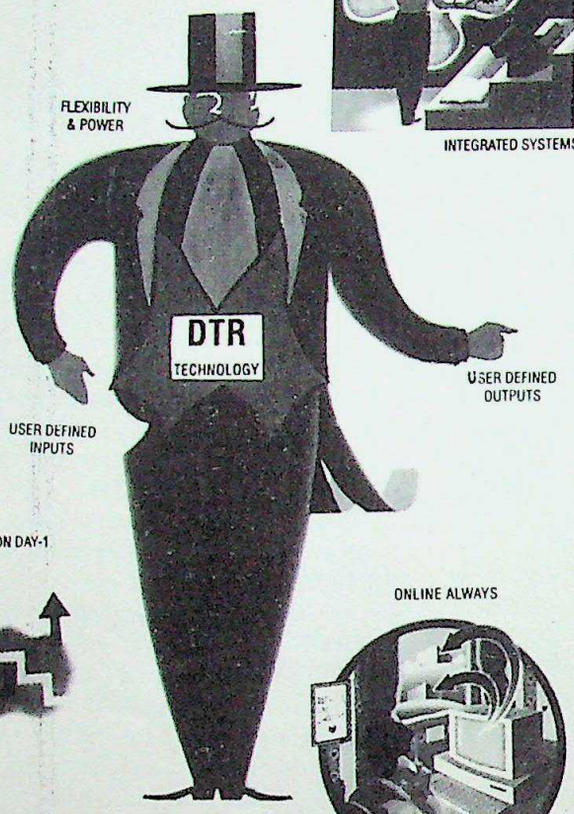


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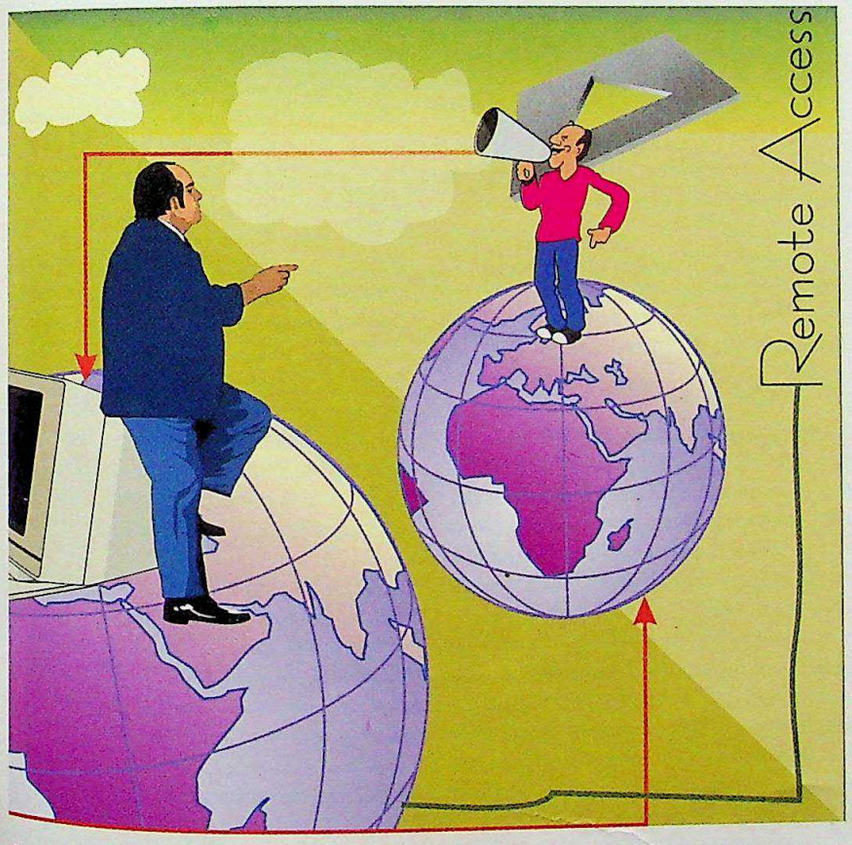
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REMOTE-NODE SERVERS

A Node from Afar

More than ever, remote-node servers are a great choice for providing users with remote access to your network.



By Steve Rigney

If you've ever had to trudge into the office on a sunny Saturday to print out a copy of a spreadsheet you promised to peruse over the weekend or if your salespeople on the road ever have to call in to check the status of an order, your office is a prime candidate for a remote-node server.

Though remote control is now the most common method of remote access, remote node will become more predominant as connection speeds increase and people

INSIDE

The remarkable adoption rate of remote- access solutions makes me wonder what's next for staying connected over long distances. Around here, we joke about chip implants for enabling mental telepathy. That doesn't seem too farfetched to me. (Maybe I'm reading too much Dale Brown.) Anyway, it's hard to imagine doing business without connecting remotely to your desktop, e-mail, online services, or something else.

TODAY YOU FOCUS on the services your users need and on how you want to set up the remote access. In this issue of *PC Magazine,* we review the year's crop of remote-control software packages (see "Friendly Takeover"). Here we review the complementary technology: remote-node servers. Remote expert and contributing editor Steve Rigney takes the lead in covering the subject.

WE ROUNDED UP the usual suspects and observed that things are moving right along. That is, nearly all vendors are steadily improving connection options—ISDN is a must now—and ease of use. Shiva, 3Com, and Microcom continue to set the pace. With ISDN well established in these products, you have more reason than ever to jump into that market, if you haven't already.

IN NEW NETWORKING PRODUCTS, technical analyst supreme Russ Iwanchuk reviews the hot, new low-end Cisco 1004 ISDN router, with EZ Setup software. EZ Setup really lives up to its name, says Iwanchuk. It is an HTML-based package that Cisco plans to make available with other routers in the same line.

In addition, Rigney reports on new releases of two network management packages: Intel's LANdesk Management Suite 2.5 and CapaCity's NetCon 3.0.

—Gail Shaffer

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use the Internet to conduct business. Remote node differs from remote control in that it uses a standard analog phone line or digital ISDN high-speed link to extend network cable to any destination in the world. While on the road, you can use your notebook to view all the drive letters and printer names you have when you're connected to the LAN. Unfortunately, the dial-up connection is a lot slower than a 10-Mbps direct Ethernet link even at 128-Kbps ISDN speeds. This makes remote node useful for applications that don't require the transmission of a lot of data, such as accessing client/server databases, e-mail, or the Web.

Instead of acting as an extension of the network cable, remote control extends your keyboard, video, and mouse connections. Because you are only sending keystroke and screen information, remote control is speedy. The connection, however, is not interactive.

THE PRODUCTS

We set out to find the most popular hardware-based remote-node servers on the market. Digital Equipment Corp. and Xylogics chose not to be in the roundup because they are working on new versions. We eliminated software-only solutions like Novell's NetWare Connect and Stampede Technologies' Remote Office, because we wanted to focus on products that both an experienced network administrator and a novice Internet service provider (ISP) could easily install and use without having to build a server. This left six products that not only allow you to connect using the PPP dial-up client built into Microsoft Windows 95 but are simultaneously compatible with the TCP/IP and IPX protocols.

INSTALLATION

Fortunately most of the vendors in this roundup provide easy-to-use utilities to help you with the installation process. Products like the LanRover/Plus, LANexpress, and AccessBuilder 2000 provide graphical Windows-based utilities that automatically detect the server and set up all the security, ports, and protocols with the click of a mouse. The RLN server is slightly more difficult. The Cisco 2509 and Whittaker Xyplex Network 3000 require you to use a dumb terminal and cryptic commands to configure the unit.

Even with fairly specific review criteria, the products showed up in all shapes and sizes with varying capabilities. Half of the products, including the Microcom LANexpress 4000, the Shiva LanRover/Plus, and the Attachmate RLN Access Server, came with internal V.34 modems. The other three provided only high-speed serial ports. Some of the products, such as the LanRover/Plus and the AccessBuilder 2000, come in a slimline rack-mountable chassis so you can easily add devices as your needs expand. Others, such as the LANexpress and the RLN, are housed in full-size PC cases that take up a lot of space.

SECURITY AND MANAGEMENT

As more businesses, particularly ISPs, open their modem ports to the public, security and management will continue to grow in importance. All of the products in this roundup provide basic user names, passwords, and dial-back security.

Most of the products also work with the CHAP (Challenge Handshake Authentication Protocol) and PAP (Password Authentication Protocol) specifications that provide additional security. Products like the Cisco 2509 and the RLN also work with third-party security servers including TACACS (Terminal Access Controller Access Control System). These systems are expensive and require a dedicated security server.

Another way to protect your resources is to limit access according to time of day or even network protocols. For example, the LanRover/Plus can allow users to access the server only using the IPX protocol, so they can't surf the Internet via the company's expensive T1 link. RLN's call accounting system will keep track of how long users have been connected and how much data they transfer. This allows you to bill users for access or just monitor their usage.

All the products in this roundup provide some type of management that allows you to see if a port is operational and in use. Products like the LANexpress even give statistics on the quality of the dial-up telephone line. You can also check for failed connection attempts, network packet errors, and the speed of connection. The way this information is presented is also important. The AccessBuilder provides nice graphs, but the Cisco 2509 requires you to use a character-based terminal to view the statistics. Fortunately, most of the products work with SNMP, so you can use a third-party management platform to provide graphical remote management.

FASTER CONNECTIONS

Two products in our roundup, the LanRover /Plus and LANexpress, come with a choice of either internal ISDN adapters or analog modems. ISDN provides faster throughput and reconnect times, and it's ideal for the stationary telecommuter. The LANexpress can provide only a single-channel 64-Kbps ISDN connection, but the LanRover/Plus works with the MP (Multilink PPP) specification, which can aggregate two channels for a 128-Kbps connection. At this speed you may even be able to run small applications across the link.

OTHER FEATURES

Some of the more exciting but often overlooked features of these products include dial-out and LAN-to-LAN routing. Although most of the products in this roundup allow you to dial out across the network, only a handful offer LAN-to-LAN routing. For example, you can use two LanRovers or two AccessBuilders to

Shiva LanRover/Plus 4.0

Boasting features suitable for either a large ISP or a small LAN, Shiva's LanRover/Plus 4.0 garners our Editors' Choice. Though some products in our roundup are housed in unwieldy PC-size enclosures, the petite LanRover ($8,999 with eight internal V.34 modems; $7,119 with four ISDN BRI adapters) can be mounted in a 19-inch rack.

PC MAGAZINE EDITORS' CHOICE

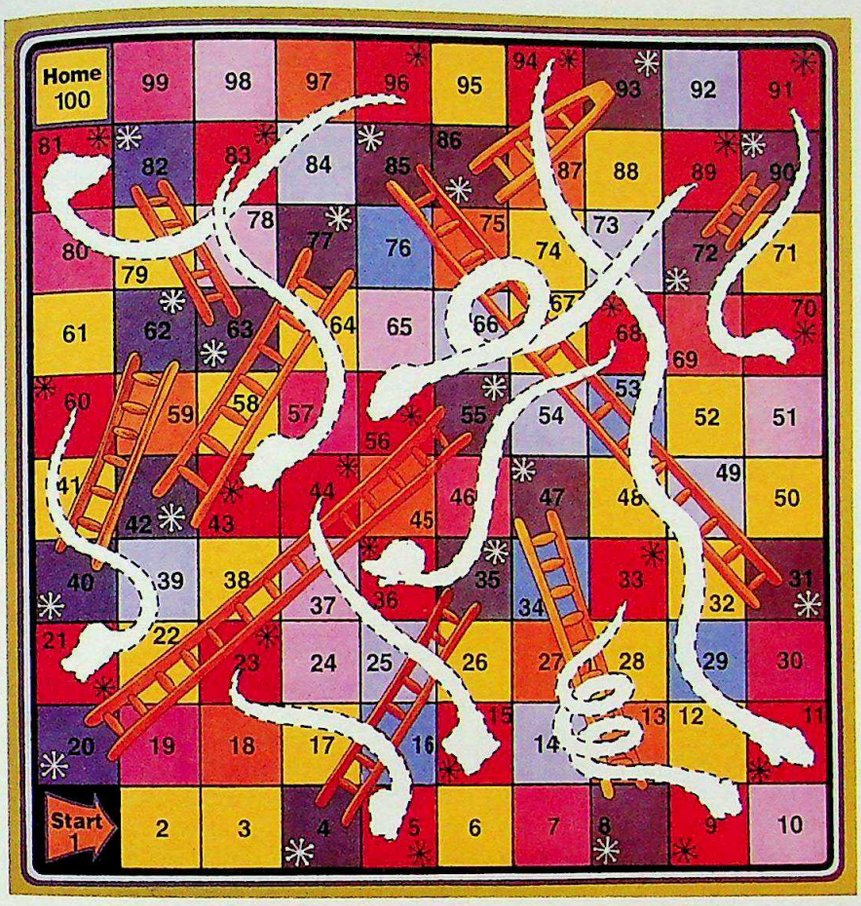
Installation and management are easy with the Shiva Network Manager (SNM) software, which works with almost every OS on the market and offers comprehensive management and statistical information.

The LanRover/Plus's scalabilty put it over the top for Editors' Choice. It's a good solution for analog connections, and ISDN support can be added as the need arises.

The 3Com AccessBuilder 2000 ($3,985 list for tested configuration) wins an honorable mention. Its easy installation, simple configuration, and competitive pricing makes the AccessBuilder a very attractive product. It provides eight asynchronous ports with dial-up capability, LAN-to-LAN routing, and bandwidth on demand.

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establish a connection between two remote networks. Because both products work with ISDN and provide bandwidth aggregation, you can use them to establish LAN-to-LAN connections faster than 128.8 Kbps. This could be a less expensive solution than a dedicated leased line, especially if you don't need the link up all the time. By the time you read this, U.S. Robotics will have released the NETserver/8, aggressively priced at $4,495, with PPP support and a new auto-configuration wizard.

With a few exceptions, remote-node server solutions continue to improve each year. You'll want to look for one that's easy to install and manage, that offers the right protocols, and that can handle your remote-access traffic. You may even decide to mix and match products. A careful look at our analysis of the products should help you pick the remote-node server that is best for you.

Attachmate Corp.

RLN Access Server

ALL REVIEWS BY STEVE RIGNEY

RLN (Remote LAN Node) started life as a software-only remote-node server but has evolved into the turnkey solution known as RLN Access Server 4.1 ($7,595 for both the hardware and software). Attachmate's engineers created the server using a standard desktop PC (in this case, a Dell OptiPlex XM575), installing an 8-port Xircom Multi-port Modem Card, and configuring the RLN software. Though it lagged behind in our performance tests, the RLN Access Server is fairly easy to install and offers excellent management and call logging features, and strong security.

Before we could turn on our server, we had to use a separate client PC to configure the RLN boot disk. This step required naming the server and deciding which protocols to use. After starting the server with the boot disk, we had the option of using the RLN graphical manager to complete configuration, including setting up user names, protocols, and security. We hit a snag when we tried to change the Xircom modem's port speed to 115.2 Kbps. The modem remained stuck at 57.6 Kbps.

Attachmate gives you several options for connecting to the server once everything is configured. You can use the bundled RLN client software for DOS, OS/2, Windows 3.*x*, and Windows 95. Although we did install and test the RLN Windows 95 client software, we used Windows 95's built-in Dial-Up Networking utility for our benchmark tests. However, the RLN Windows 95 client offers extra features such as multiple phone books and a terminal emulator.

In addition to basic management features like monitoring network traffic and port usage, RLN adds a unique feature called Advanced Call Accounting. This Microsoft Access–based utility logs RLN session information into an access database. You can use Call Accounting to audit your remote RLN users based on the duration of the call or the amount of data sent or received. You can also view a report of port utilization to see if you need to add more servers. This is a great utility if you need to keep track of remote usage for billing information.

RLN scored last in our performance tests and was particularly slow with compressible files. According to Attachmate, RLN encounters PPP errors using the Windows 95 Dial-Up Networking utility to connect to the server. Attachmate representatives say it will be fixed in a later release this summer. We tried the same tests with Attachmate's RLN Windows 95 dial-up PPP client but didn't see any noticeable difference.

The great advantage of RLN is that because it is primarily a software solution, you can build almost any remote-node server you want. For example, you could configure a RLN server with modems, ISDN cards, or even X.25 adapters. And the software is probably the most flexible solution on the market. Despite its considerable size and low performance numbers, the RLN Access Server is a solid turnkey solution.

RLN Access Server 4.1. List price: For tested configuration, $7,595. Attachmate Corp., Bellevue, WA; http://www.attachmate.*com*. *(Indian partners, C-Tel, Decibell Computers, Bombay.)*

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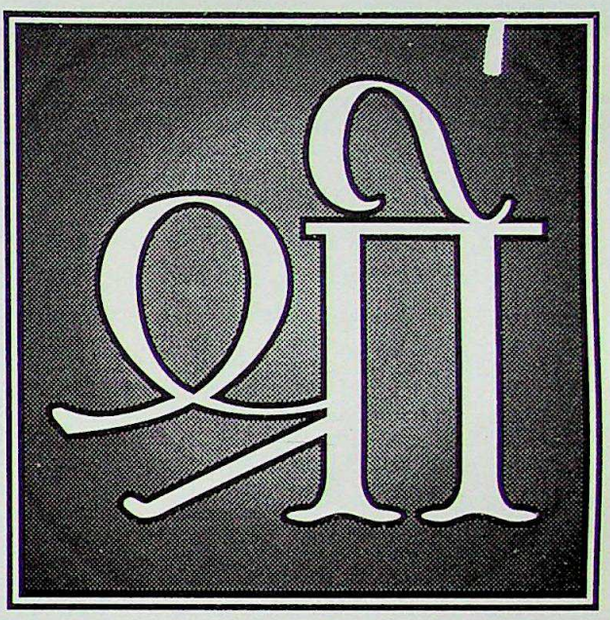
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PERFORMANCE TESTS

Remote-Node Servers

Because modem rate is usually a constant, we focused on the performance of the compression algorithm for our six remote-node servers. The LanRover led the pack on the highly compressible file tests, with the LANexpress a close second.

What the Numbers Mean

Our test files ranged from highly compressible graphics files to noncompressible executable files. LanRover, which uses Stac's LZ compression, provided the best performance on the highly compressible file test. Because Attachmate's RLN software was not able to compress the file, transfer times were slower. All products had similar throughput on the less-compressible files. A fast built-in modem or serial port is crucial, but a good compression scheme can be just as important depending on the remote tasks you do. —*Analysis written by Steve Rigney*

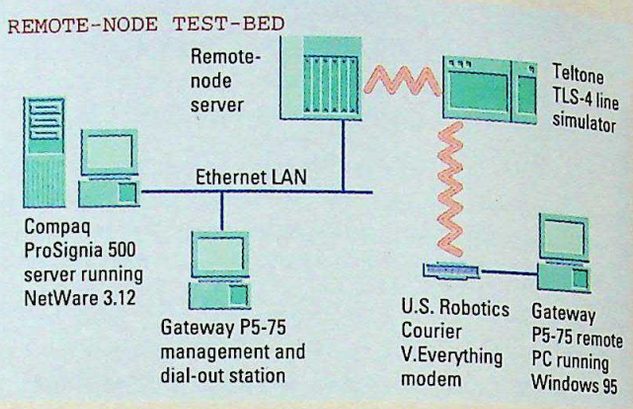
How We Tested

We tried to test these products in ways that reflect how they're used on real LANs. We also wanted to gauge their ability to work on the business end of an Internet service provider (ISP).

Networks are increasingly using multiple protocols. The IPX protocol, now a part of both NetWare and Windows NT, is the most common. Many administrators, however, are adding TCP/IP to service intranet Web servers and perhaps to provide corporate Internet access. Of course, IP is what ISPs need. We connected to our remote-node servers using both protocols and evaluated the management reports and services they provide.

With these scenarios in mind, we set up each remote-node server on an Ethernet LAN with a server running NetWare 3.12. One networked PC acted as a management console and as a client for any network dial-out features that the products included. We installed both IPX and TCP/IP on our test network. We used Windows 95 on our remote PC, and we configured both the IPX and TCP/IP protocols for our dial-up adapter driver. We used U.S. Robotics Courier V.Everything modems for the client and access servers without modems. A Teltone TLS-4 line simulator provided consistent connections.

We established a remote-node connection to the NetWare server and downloaded five different files using the Windows 95 Explorer copy command. We downloaded each file at least three times and reestablished the connection between each copy to eliminate outside factors such as a bad modem link. We also set both the remote and host modems to a data rate of 115.2 Kbps on the serial port side.



Remote File Transfer

Minutes:seconds	Highly compressible file (7.7:1 ratio)	Moderately compressible file (2.5:1 ratio)	Slightly compressible file (1.3:1 ratio)	Noncompressible file (1:1 ratio)
Attachmate RLN Access Server 4.1	6:23	2:10	1:21	0:53
Cisco Access Server 2509	2:02	0:49	0:48	0:46
Microcom LANexpress 4000	1:53	0:48	0:47	0:45
Shiva LanRover/Plus 4.0	1:48	0:53	0:53	0:53
3Com AccessBuilder 2000	2:15	0:52	0:49	0:48
Whittaker Xyplex Network 3000 Remote Access Router	1:57	0:49	0:49	0:52
	◀ BETTER	◀ BETTER	◀ BETTER	◀ BETTER

Cisco Systems Inc.

Cisco Access Server 2509

Like Whittaker Xyplex's Network 3000 line, the Cisco 2500 series of remote access servers is powerful but confusing to install. We looked at the Cisco Access Server 2509, a unit that has not really changed since our last review of remote-node servers a year ago.

The Access Server 2509 includes eight asynchronous serial ports and is available in two versions. The basic Access Server 2509 package ($3,545) works only with the IPX and TCP/IP protocols. The Enterprise version ($5,405 with Stampede's Remote Office dial-in software) is available for IPX, TCP/IP, AppleTalk, DECnet, and XNS protocols.

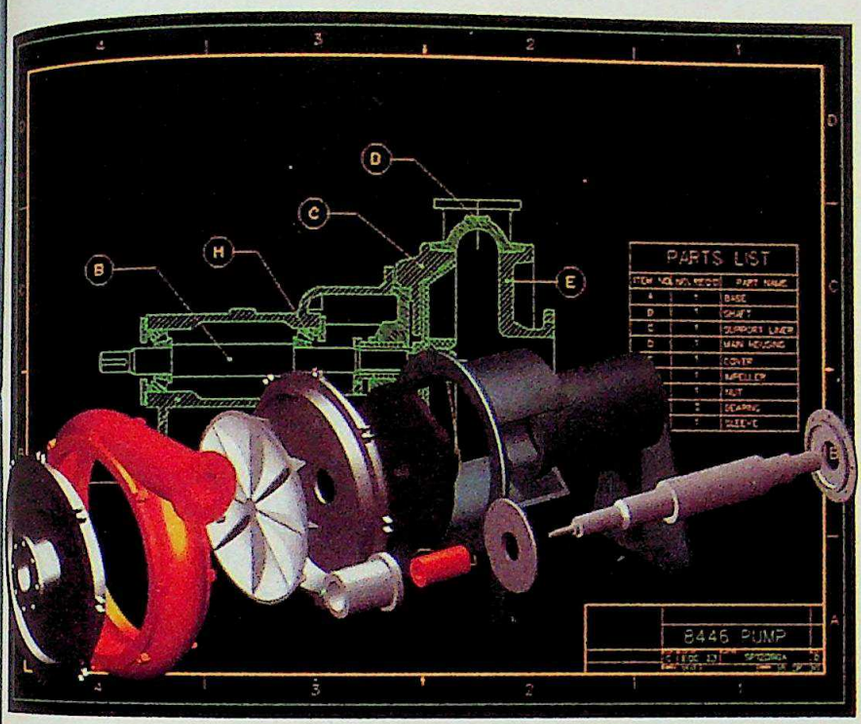
The first thing we noticed when we unpacked the Access Server 2509 was the lack of a basic installation manual. In place of a manual was the UniverCD CD-ROM, which contains installation, management, and Cisco product information stored in HTML format (fortunately the Verity Mosaic Web browser comes included). UniverCD is a unique concept, but it did not make installing the product any easier. UniverCD runs on Macs as well as Unix and Windows-based PCs.

In order to configure the server you

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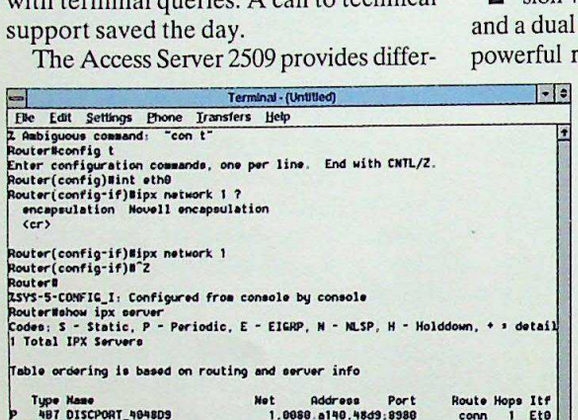
PRESSMAN

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must use a terminal and cryptic IOS (Internetworking Operating System) software commands. Almost all of Cisco's routers run IOS, so if you currently have any Cisco products you may already know some of the basics. We had problems configuring the unit because some of the HTML documents were out of order, hindering our ability to keep up with terminal queries. A call to technical support saved the day.

The Access Server 2509 provides different levels of error logs, ranging from the occasional packet error to serious lost connections. Though all of the management logs and reports are impressive, the product requires that you use the terminal to view them. Cisco offers an optional SNMP-based management utility called CiscoWorks. A more graphical alternative is HP OpenView.



ACCESS SERVER 2509: *You need to use a terminal and IOS commands for manual configuration.*

Despite obvious setup and configuration difficulties, we were impressed with the Access Server 2509's performance and durability. We were able to reconnect to the server within seconds of resetting the power. In addition, the unit has call-back and connection limits and the ability to dial out across the network if you are running the TCP/IP protocol.

The Access Server 2509 impressed us with its ability to use asynchronous serial ports in place of the traditional synchronous WAN links. But unless you want to learn hundreds of complicated commands, and search through countless Web pages for error messages and documentation, you should probably look elsewhere for your remote-node solution.

Cisco Access Server 2509. List price: For tested configuration, $3,545. Cisco Systems Inc., San Jose, CA; http://www.cisco.com.
(indian subsidiary Cisco India, New Delhi; partners Datacraft-ICIM, Bombay; HCL-HP, New Delhi; Microland, Wipro, UB Networks, Bangalore.)

Microcom Inc.

LANexpress 4000

Though it looks like a full-size desktop PC, Microcom's LANexpress 4000 Version 4.0 ($5,190, with one ISDN adapter and a dual V.34 modem adapter) is really a powerful remote-node server housed in a standard PC case. Available in custom-configured combinations of internal V.34 modems or ISDN BRI adapters, LANexpress 4000 offers a wide range of configuration options. An extensive array of management software and features, such as bundled remote-control software and dial-in/dial-out capabilities, makes the product even more attractive. LANexpress 4000's biggest flaw is that it currently doesn't work with the Multilink PPP specification, so your ISDN connections are limited to 64 Kbps.

Like the AccessBuilder and the LanRover remote-node servers, the LANexpress only requires about 30 minutes to set up and configure. After you connect all of the cables, the server will automatically determine the number of modems or ISDN adapters installed in your system and the type of Ethernet frame you are using.

After setup, you can use the Windows-based expressWatch software to configure network protocols and activate security. The utility also provides a great interface for monitoring remote users. You can choose from several different views for monitoring network packets, network errors, connection speeds, and even the quality of the dial-up phone line. The Snapshot utility allows you to save a picture of your monitoring charts for future reference.

Along with Microcom's Carbon Copy remote-control software, the LANexpress comes with dial-in software for DOS, Windows 3.*x*, and Windows 95. It also includes a terminal emulator for calling online services. Though the LANexpress Windows 95 client offers a nice interface, using the built-in PPP dial-up utility in Windows is just as convenient and fast. Using Windows 95's dial-up adapter client software, the LANexpress provided the fastest overall file-transfer performance of any product in this roundup. The product also works with the ARAP (AppleTalk Remote Access Protocol), IPX, NetBEUI, and TCP/IP protocols to allow you to access almost any host network. The package allows you to dial out across the network from any DOS- or Windows-based client PC.

Unfortunately, the LANexpress is missing features that some LAN administrators find essential. Unlike the LanRover, the LANexpress doesn't possess dynamic bandwidth allocation or the ability to establish LAN-to-LAN connections between two LANexpress servers.

LANexpress's ease of installation and powerful management software make it an ideal solution for small to medium-size networks that need to add a remote-node/remote-control server. LANexpress boasted impressive Asynchronous Modem test results, but it might not be fast enough for the true power user. The large chassis hinders LANexpress 4000's attractiveness to large remote-node locations such as ISPs.

LANexpress 4000 Version 4.0. List price: For tested configuration, $5,190. Microcom Inc., Norwood, MA; http: //www.microcom. com.
(No Indian partner.)

Shiva Corp.

LanRover/Plus

PC MAGAZINE EDITORS' CHOICE

Shiva has been doing remote node for a long time and continues to churn out better and better products. Despite some management software/protocol incompatibility issues, the LanRover/Plus 4.0 ($8,999 with eight internal 28.8 Kbps V.34 modems; $7,119 with four ISDN BRI adapters) is no exception. With easy installation and configurability, it can manage your bandwidth to save money and provides dial-in, dial-out, and LAN-to-LAN connectivity using IPX, NetBEUI, and TCP/IP network protocols.

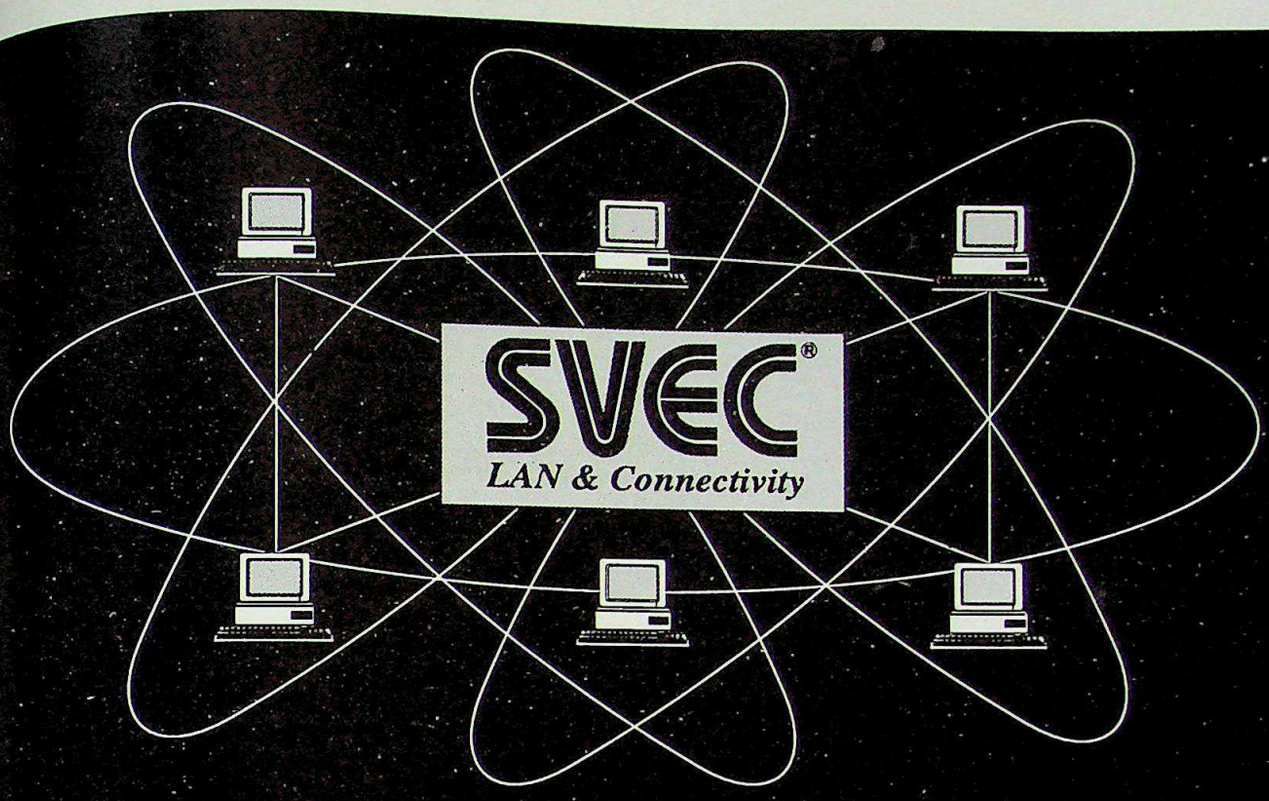
Housed in a chassis slim enough for a 19-inch rack or a cluttered wiring closet, the LanRover offers a minimalist installation procedure as well. Simply connect the network cable, phone line, and AC power cord and install the Shiva Network Manager (SNM) software.

The SNM software, which is similar to 3Com's Transcend AccessBuilder Manager in offering extensive management and statistical information, runs on any Macintosh or DOS or Windows-based PC. In addition, it automatically finds the LanRover and allows you to configure users, ports, protocols, and connection methods. The LanRover also includes an SNMP agent if you want to manage the unit using a third-party package, such as HP OpenView.

Unfortunately, the SNM utility will not

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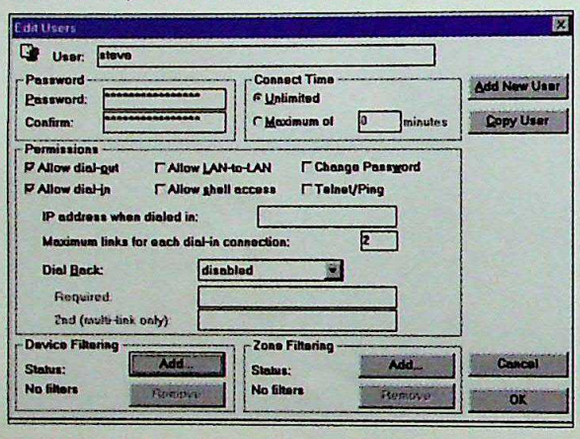
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work if you have the IPX protocol bound to a dial-up adapter on a PC running Windows 95. To solve this problem, we had to remove the protocol from the Windows 95 dial-up adapter, configure the LanRover, and then re-install IPX on our test PC to establish a remote connection to our NetWare file server. Nor will SNM work with Windows for Workgroups if you have the IPX/SPX compatible transport installed.

One of the most useful features of the LanRover is its virtual connection capability, which can save money on long distance phone calls. Unlike the other products in this review, the LanRover will automatically suspend and resume a physical connection without the user knowing anything has happened. By spoofing the network protocols, LanRover tricks the remote PC into "thinking" it is still connected to the network. It will automatically re-connect if data needs to be transmitted to or from the host network.



LANROVER/PLUS: *Shiva's SNM utility provides easy network protocol and dial-in/dial-out setup.*

While the LanRover was not the fastest product in our test, its performance numbers ranked with top of the pack. Shiva boosts performance using Stac's compression algorithm over both analog and ISDN connections. With ISDN, the LanRover will work with the MP (Multilink PPP) specification to provide up to 128 Kbps of raw bandwidth.

The LanRover is a great remote-node solution for small or large networks. The product is easy to install and use, provides client software for almost every OS on the market, and allows you to start with a slow analog solution and move up to ISDN as the need arises. With dial-in, dial-out, bandwidth on demand, and LAN-to LAN capabilities, there isn't much the LanRover can't do.

LanRover/Plus 4.0 List price: For tested configuration, $8,999. Shiva Corp., Bedford, MA; http://www.shiva.com.
(Indian partner T-net, A23 Green Park Main, New Delhi 110 016. Tel: 669384, 6969699.)

3Com Corp.

AccessBuilder 2000

It doesn't have internal modems or ISDN adapters like the LanRover/Plus or LANexpress, but 3Com's AccessBuilder 2000 provides a powerful and affordable solution for workgroup remote access. Housed in a rack-mountable chassis similar to the LanRover/Plus, the AccessBuilder 2000 comes with graphical, user-friendly management software. Though it doesn't do dial-out, it provides dial-up capability, LAN-to-LAN routing, and bandwidth on demand. And the AccessBuilder 2000 performed admirably on our performance tests. The unit is available in 4-port ($2,795) and 8-port ($3,895) asynchronous models.

Installing and configuring the AccessBuilder was a snap. The product offers two options for configuring users and ports: a terminal and the Windows-based TABM (Transcend AccessBuilder Manager) software. Like Microcom's expressWatch software, TABM is a graphical utility that lets you view all of your remote- node servers.

To set up a port, you simply select the graphical port image and select from a list of modems. Unfortunately, the AccessBuilder offers a limited list of modem initialization strings. To set up users, you can manually enter individual names and security rights, or you can import user information from the Novell NetWare Bindery or NDS (NetWare Directory Services). This is a great feature if you have dozens of users.

The TABM utility is also useful for managing multiple AccessBuilders from a single location. TABM can keep track of who is connected and for how long. You can also keep track of any network or dial-up errors and other traffic information. Another nice feature of TABM is the ability to monitor usage based on network protocols. This will help you determine if remote clients are using the AccessBuilder as a way to access the Internet through the company's TCP/IP router. The TABM utility works with a dial-up connection or any network running TCP/IP or IPX.

Like the LanRover/Plus, the AccessBuilder 2000 provides bandwidth or tariff management to keep your connection costs low. Bandwidth management automatically disconnects a link when no traffic is moving and reestablishes the connection when you transmit data to or from the remote network. It can require several seconds to reestablish a modem connection, but re-connection time is lightning-fast with ISDN.

The AccessBuilder's bandwidth-on-demand feature allows you to add more throughput as the connection requires. Bandwidth on demand works only with the LAN-to-LAN connections and is best used with the ISDN Multilink PPP specification that allows you to add more channels as necessary. The AccessBuilder, however, also allows you to use several dial-up asynchronous connections to increase LAN-to-LAN performance.

Although it didn't provide a setup string for the U.S. Robotics Courier modem used in our performance test, the AccessBuilder performed impressively. With its capability for integration with larger AccessBuilder servers and its low price tag, the AccessBuilder is a great server to set up at your remote workgroup locations.

AccessBuilder 2000. List price: For tested configuration, $3,895. 3Com Corp., Santa Clara, CA; http://www .3com.com.
(Indian subsidiary 3Com India, New Delhi; partners Godrej Pacific Bombay; HCL-Comnet, New Delhi; Melstar, Bombay; PCL, New Delhi.)

Whittaker Xyplex

Network 3000 Remote Access Router

As if deciding which product in Whittaker Xyplex's Network 3000 line would best meet your remote-access needs wasn't confusing enough, installation and operation are equally confounding. Though the Network 3000 Remote Access Router boasts impressive performance and several connectivity options, it doesn't provide any bundled remote-access software and is difficult to set up, configure, and manage.

We tested a $3,195 Network 3000 Remote Access Router with one asynchronous module, eight ports, and one synchronous V.35 module. For the same price, however, you can purchase two asynchronous modules or one asynchronous and one ISDN module.

Installation was supposed to be as easy as running the Windows-based FocalPoint utility, but we thought the Network 3000 was the most complicated product to set up. FocalPoint allows you to select which modules you have installed and set up the ports and the type of network protocols you want to use (including TCP/IP and IPX). FocalPoint simultaneously cre-

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SUMMARY OF FEATURES

Remote-Node Servers

PC MAGAZINE NETWORK EDITION EDITORS' CHOICE

■ YES ■ NO
In alphabetical order by company

	Attachmate Corp. **RLN Access Server**	Cisco Systems Inc. **Cisco Access Server 2509**	Microcom Inc. **LANexpress 4000**	Shiva Corp. **LanRover/Plus**	3Com Corp. **AccessBuilder 2000**	Whittaker Xyplex **Network 3000 Remote Access Server**
List price (tested configuration)	$7,595	$3,545	$5,190	$8,999	$3,895	$3,195
Hardware						
Number of analog/ISDN ports	32, 32	8, 0	12, 8	8, 4	8, 0	16, 2
Internal V.34 modem	■	■	■	■	■	■
Internal ISDN adapters	■	■	■	■	■	■
Number of WAN interfaces	32	2	12	8	8	2
Bandwidth on demand	■	■	■	■	■	■
Dial-in/dial-out capability	■■	■■	■■	■■	■■	■■
LAN-to-LAN connection	■	■	■	■	■	■
Software						
Includes remote-control software	■	■	■	■	■	■
Supported NOS protocols:						
AppleTalk, IPX/SPX, NetBIOS	■■■	■■■	■■■	■■■	■■■	■■■
PPP, TCP/IP	■■	■■	■■	■■	■■	■■
Supports MP over ISDN	■	■	■	■	■	■
Simultaneous log-on with single name	■	■	■	■	■	■
Supports NetWare VLMs	■	■	■	■	■	■
Management						
Management via remote console	■	■	■	■	■	■
Monitors and resets individual ports	■	■	■	■	■	■
Single-port configuration/statistics	■■	■■	■■	■■	■■	■■
Security						
Call-back/roaming options	■■	■■	■■	■■	■■	■■
Data encryption	■	■	■	■	■	■
Integrate log-on with NetWare's Bindery	■	■	■	■	■	■
Password authentication supported	■	■	■	■	■	■

ates a complicated script that is downloaded to the Network 3000 unit. Unfortunately, FocalPoint didn't correctly configure our server, so we spent several hours in front of a PC typing cryptic terminal commands. The documentation was not very thorough, so we also spent a lot of time on the phone with technical support. To make matters worse, our unit had a faulty asynchronous module that the vendor had to replace before we could begin testing.

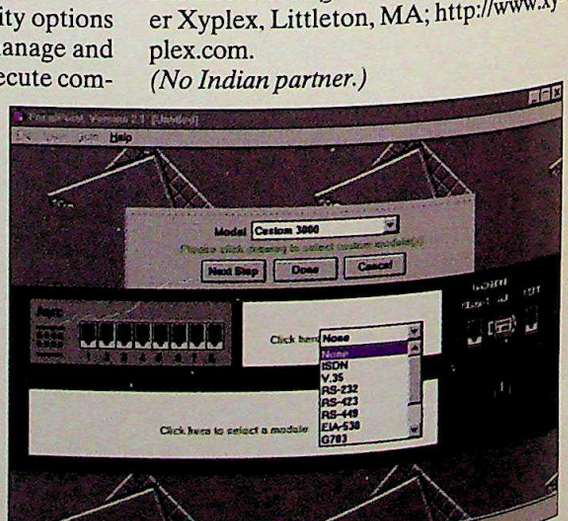
Although you can use most PPP dial-up software, such as the Dial-Up Networking utility in Windows 95, to connect to the Network 3000, the product doesn't include any software for DOS- or Windows 3.*x*–based PCs. The vendor recommends using Remote Office, from Stampede Technologies, for these remote clients. Currently, there is no solution for dialing out across the network.

Some of the strong points of the Network 3000 include top-notch performance and scalability. Each available module in the same unit interacts with the others. For example, you could connect to the network via the dial-up asynchronous module and then automatically go through the WAN module in the same unit to connect to other remote servers. The ISDN modules also work with Multilink PPP and provide bandwidth on demand to increase the speed of the connection.

While all of these connectivity options are nice, they are difficult to manage and configure. And you have to execute complicated commands to gather information and monitor for errors. The Network 3000 does include a SNMP agent so you can use an optional SNMP management console, such as Whittaker Xyplex's ControlPoint, to monitor your Network 3000 servers graphically.

If you need to have analog, Frame Relay, ISDN, and X.25 all in the same box, Whittaker Xyplex's Network 3000 family of products may be your solution. If management is important and you need an easy way for your remote users to establish a dial-up remote-node connection to the LAN using multiple protocols, however, you may want to check out one of the other products in this roundup. □

Network 3000 Remote Access Router. List price: For tested configuration, $3,195. Whittaker Xyplex, Littleton, MA; http://www.xyplex.com.
(No Indian partner.)



NETWORK 3000: *A graphical view of installed modules.*

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HANDS-ON REVIEWS OF NEW SHIPPING PRODUCTS

NETWORK MANAGEMENT SOFTWARE

Managing the Total Package

By Steve Rigney

If your network is big enough to require a management package, chances are the network isn't nice and neat—but big and messy. You need software distribution, hardware inventory, software inventory, remote control, and traffic monitoring utilities. In addition, your LAN may have grown to include clients running DOS, OS/2, Microsoft Windows 3.*x*, Windows 95, and Windows NT. You may also have different flavors of server platforms.

In this miniroundup, we look at two full-featured solutions: Intel's LANDesk Management Suite, Version 2.5 (LDMS), and CapaCity's NetCon, Version 3.0.

Intel Corp.

LANDesk Management Suite

Think of all of Intel's network utilities, including Server Manager Pro, Workgroup Manager, and Virus Protect. Now think of the best parts and pieces of each and you have LANDesk Management Suite (LDMS), Version 2.5. LDMS offers software distribution, hardware and software inventory, remote control, software metering, server and network traffic statistics, and integrated alerting and notification. But its major selling point is its ability to manage both Windows NT– and NetWare-based file servers and all of your client PCs, whether they're running DOS, Windows 3.*x*, Windows 95, Windows NT, or OS/2.

LDMS is still tied to NetWare, however; because of its reliance on NLMs, you must have at least one NetWare 3.*x* server or later on your network and 5 to 10MB of RAM on your file server for the NLMs. Another of LDMS's drawbacks is its use of a Btrieve database for storing network management information. Unlike NetCon's ODBC-compliant database, a Btrieve database doesn't provide the flexibility to export your network management information. Intel is working on a SQL/ODBC database for LDMS that will be provided free to current users.

This product retails for $750 for a five-user license; it comes on a single CD-ROM and includes detailed documentation. We found installation fairly straightforward, though we did have to edit the NetWare and Windows NT logon scripts manually and make changes to a few NetWare NCFs.

Like NetCon, LDMS allows you to manage multiple client PCs running DOS, all versions of Windows, and OS/2. LDMS also provides remote control for NetWare servers and will include a free version for Windows NT by the end of the summer. And it gathers SNMP information and can monitor other servers running Microsoft's SMS and Novell's ManageWise.

A hot new feature of LDMS is remote control and management of client PCs across the Internet or corporate intranet. This lets you control any client PC equipped with a modem and Web browser. In addition to controlling users' PCs, you can scan hard disks for software, gather hardware information, and send software updates.

LDMS offers powerful server statistics for NetWare and Windows NT file servers, which NetCon does not. You can also use LDMS to monitor network traffic from all your servers and client PCs. The monitor will automatically write information to a log file, so you can let it run

Continues on page 42

ISDN ROUTERS

Cisco Makes Routers EZ

By Russell Iwanchuk

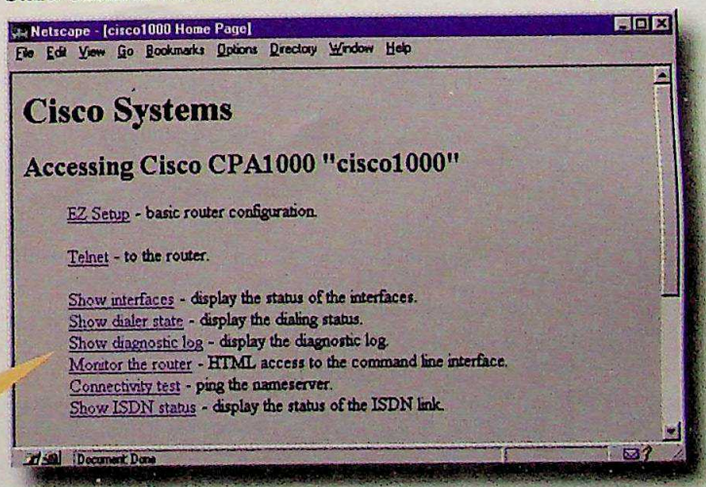
With the explosion of the Internet, everyone's got to have a home page. And if Cisco Systems has its way, your router will be no exception.

Playing a central role in this act is the Cisco 1004 ISDN router ($995 list). The router, a tidy desktop unit that's a perfect fit for its small- and home-office market, has one 10Base-T Ethernet port, one ISDN BRI port, an administration console, and an integrated NT-1.

The Cisco 1004 also has a PC card slot, so you can upgrade its software with a flash memory card painlessly. Its simple LED provides an instant status report for either B channel and for LAN port activity. This router also supports Multilink PPP, enabling throughput of 128 Kbps using both B channels.

But what gives the Cisco 1004 its star billing is the new EZ Setup, which is part of ClickStart. ClickStart is HTTP server software based on Web technology that is integrated into the Internetwork Operating System and allows TCP/IP hosts on any platform to access the router's IOS using a Web browser. With the 11.0.6 release of its IOS, Cisco brings ClickStart to its router line. ClickStart lets users who are not proficient in Cisco's arcane command-line interface use a Web browser to do any-

Continues on page 44



EZ DOES IT: *Cisco's HTML-driven setup eases the usual sticky router configuration.*

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LANDesk

Continued from page 41

overnight or over the weekend.

The Alert Management System (AMS) utility is also unique and useful. It is a unified alert and notification utility that lets you know if there's a problem and then takes steps to fix it.

Another plus on the LDMS feature list is the Desktop Management Interface (DMI) management control panel. The console allows you to manage and control all the DMI hardware and software components on your network. Components that include DMI can provide detailed low-level information, such as the exact date of the BIOS, type of keyboard, and all the IRQs for your hardware.

LANDesk Management Suite, Version 2.5. List price: For five users, $750. Intel Corp. Santa Clara, CA; http://www.intel.com. *(Indian subsidiary Intel Asia, Bangalore; partners Godrej Trading, Priya International, SES Computer, Bombay.)*

CapaCity Software Corp.

NetCon 3.0

Though not as popular as some of the better-known network management packages, CapaCity's NetCon 3.0 has such powerful features that you may wonder how you lived without it. It includes hardware and software inventory, software metering, software distribution, automatic job scheduling, network file management, remote control, and a help-desk utility. The management console runs on multiple platforms including all flavors of Windows and OS/2, and you can control multiple client PCs running DOS, Windows 3.*x*, Windows 95, Windows NT, and OS/2.

What the product lacks is network traffic information, server statistics, and virus protection, and we found it difficult to use at times. For example, the main menu is somewhat confusing and hard to navigate. Everything is presented hierarchically, and it takes several mouse clicks to get to the most basic information.

Unlike LDMS, however, NetCon doesn't require any server specific drivers, so you aren't limited to a specific NOS. NetCon will work on most major networks.

This package retails for $995 for a 10-user license with a single console, and site licenses of 100 or more cost about $60 per client. You receive one console license for every 100 additional client licenses you purchase, or you can purchase a console license for $495.

Compared with LDMS, NetCon is a snap to install. The software comes on a single CD-ROM or multiple diskettes, and documentation is available online or in hard copy.

After we got the product installed, we found one of our favorite features: NetCon's help desk. You can use the help desk to log problems on a client PC and create a trouble ticket automatically. On our test, we used the built-in alerts to notify the administrator whenever a client PC was low on disk space or memory. And we used NetCon's automatic configuration capture to see if the user made changes that caused the problem.

NetCon's software inventory utility provides an extensive list of software packages, vendors, and version information. You can also manually add any software information that NetCon can't determine from the hard disk scan. The information is then automatically added to the NetCon database, which was created using Microsoft Access 2.0 and is compatible with any other Open DataBase Connectivity–compliant (ODBC) application so you can import and export information to and from other programs.

While NetCon's software inventory is top rate, the hardware inventory doesn't provide as much information as LDMS's. The query/action capabilities of the product are unique and extremely powerful. We were able to compile a list of all client PCs with less than 30MB of disk space, automatically delete unnecessary files, and perform other tasks. For each criterion you can base a query on, NetCon allows you to create a dynamic group.

As for remote control, the developers at NetCon decided to bundled Stac's ReachOut instead of developing their own remote-control solution. ReachOut allows you to control your DOS, Windows 3.*x*, and Windows 95 client PCs remotely across any network running IPX, TCP/IP, or NetBIOS. ReachOut also provides a chat and file transfer utility so you can communicate and send files to the remote PC.

NetCon 3.0. List price: For 10 users, $995. CapaCity Software Corp., Berlin, MA. *(No Indian partner.)*

CROSSTALK



"This LDMS product just hopped onto our radar screen, but it's not a new (read immature) product. It's been popular in Europe for a while, and the company is now directing some marketing at the U.S. I predict it will do quite well in our next roundup of network management products."

Frank Derfler



Gail Shaffer

"It's impressive, Frank, but it's still an NLM. Our readers are adopting Windows NT, Unix, and OS/2. Novell's licensing strategies make it expensive to increase the size of 3.*x* LANs and push people to 4.*x* upgrades, but many people are totally jumping ship. LDMS will be more impressive when it doesn't rely on having a NetWare server somewhere in the system."

SUMMARY OF FEATURES

Network Management Software

■ YES ■ NO

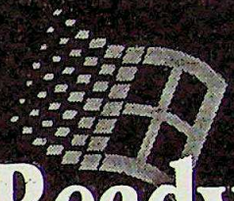
Products listed in alphabetical order	LANDesk Management Suite	Microsoft System Management Server*	NetCon
Software inventory	■	■	■
Hardware inventory	■	■	■
Software metering	■	■	■
Software distribution	■	■	■
Server replication	■	■	■
Network traffic monitoring	■	■	■
Alert and notification	■	■	■
Help desk	■	■	■
Virus scanning	■	■	■
Remote Control			
NetWare	■	■	■
Windows NT	■	■	■
Windows 3.*x*	■	■	■
Windows 95	■	■	■
DOS	■	■	■
Server statistics			
NetWare	■	■	■
Windows NT	■	■	■

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Cisco 1004

Continued from page 41

thing that's possible from the command line.

EZ Setup uses an intuitive HTML form to gather the few pieces of information needed to get the router up and running. No longer do companies need on-site experts when deploying routers; anyone comfortable with a Web browser will suffice.

Other currently or soon-to-be shipping Cisco routers that can be configured with EZ Setup are the Cisco 1003, which is identical to the Cisco 1004 but lacks an integrated NT-1 ($795); the Cisco 1005, which has the same base configuration as the Cisco 1004 but features an asynchronous port rather than a BRI port ($795); and Cisco's IP Exchange, an Internet gateway for Novell NetWare users ($2,495 for a 20-user version).

In addition, Cisco plans to extend the EZ Setup functionality to other lines of routers. If you bought a 1000 series router before the 11.0.6 release, however, don't despair: You can download the IOS image for free and update your software.

Using HTTP to configure network devices makes good sense. You can access the router from any platform that sports a TCP/IP stack and a browser, and the graphical interface possible with HTML makes configuring routers a lot less daunting.

Configuring with HTML isn't new to the router industry. Tribe Computer Works was first with its WebManage software, which was released more than a year ago. Still, very few people have Tribe routers. Cisco's leadership in the router industry should make HTTP configuration more widespread.

In the lab, we found that HTTP configuration lives up to its promise of easing out-of-the-box router configuration. We used our test unit to connect a small TCP/IP LAN to an ISDN ISP, and we were pleased with the results. After connecting the router to your LAN and BRI ports and powering it up, you simply point a browser on your network to a certain URL (*http://new-router.cisco.com*).

The router serves up the EZ Setup page—you fill in the blanks. Click on Submit and the router saves the configuration and restarts a functioning ISDN router, provided the router on the other end uses defaults Cisco found to be common. We had to fiddle with a couple of settings to get our router to be interoperable with the Ascend at the other end of the cable.

Our only real complaint with EZ Setup is that when you use it to browse an already-configured router, the fields of the configuration form are blank. Apparently, it's easier to get the configuration information into the IOS than to get it out and into an HTML form. Cisco is working on this problem. But we never had to use a serial cable or a terminal emulator (the way you usually access a router for the first time).

The Cisco 1004 has the same hardware as when it was announced in September 1995, but the addition of HTTP configuration to the IOS makes this ISDN router really stand out. It's an excellent way to connect a remote office to a central office or connect a LAN to an ISP. Look for other vendors to jump on the bandwagon.

Cisco 1004. List price: $995. Cisco Systems Inc., San Jose, CA; http://www.cisco.com.

(Indian subsidiary Cisco India, New Delhi; partners Datacraft, Bombay; HCL-HP, New Delhi; Microland, Wipro, UB Networks, Bangalore.)

MULTIPLE ACCESS By Steve Buehler

If It Ain't Broke. . .



"If it ain't broke, don't fix it." Many a network administrator lives by these words. A handy corollary is that if something *is* broken, the last changes that you or your users made are probably responsible. This thinking governs the approach of the big boys of network management—Symantec's Norton Administrative Suite and McAfee's SaberTools 6.0. If your network management software can observe the changes occurring on users' desktops, as these programs do, you've got a head start on tracking problems and offering solutions. But although both tools keep track of hardware and software configurations on your users' desktops, they are pretty high-end and might not match your needs exactly. Two new programs with slightly different aims from those of Symantec's and McAfee's products just showed up at *PC Magazine*'s network labs.

If your users have opted for the stability and security of OS/2 on their desktops, a new offering called Desktop Commander ($49 per seat), from Pinnacle Software, is well worth checking out. This product asks a user to sign on, then presents a "Machine-Independent Desktop" as the administrator has defined it. The same desktop always appears for a specific user regardless of the particular machine. This lets you set up customized desktops for groups (such as tellers or order-entry personnel) that require only certain applications and services. Security-rights checking for individuals adding to, modifying, or deleting from the desktop lets you prevent the installation of DOOM where you don't want it.

Desktop Commander is easy to install and removes the need for using REXX programming to set up standard desktops. And in an interesting twist, because one of Pinnacle Software's cofounders came from American Airlines' 250,000-node–network environment, Pinnacle designs this product (and everything in the product line) to monitor the efficient use of network bandwidth.

The other new product family in this area consists of NodeVision Pro and NodeVision, from Fresh NetSoft. NodeVision Pro offers many of the same features that the Symantec and McAfee products do—hardware and software inventory, application installation and configuration, and application metering. But at $499 per console and $10 per workstation, this program is targeted at the value-driven purchaser.

If all you want is to handle changes to desktops, the most common cause of users' problems, then Node Vision ($298 per console) may be sufficient. With an easy-to-use interface, this product is a real time-saver if your users occasionally make mistakes in altering their desktops.

If you can remember the last time you got through to a vendor's tech-support personnel, you know that they ask first about recent changes in the network. With these products, you can be prepared when your users ask you to help clean up the mess they just made. Now you can ... "just fix it."

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JOHN C. DVORAK

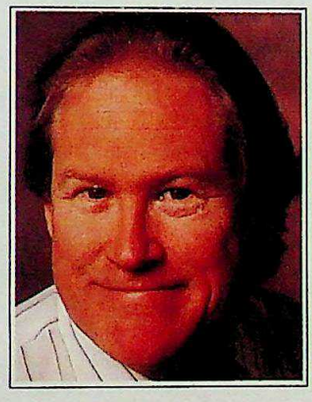
OS Decay: Here to Stay?

At one time or another, we've all experienced it. After installing one too many programs, your PC begins acting up or simply slows down. Weird error messages you've never seen before appear. The computer seems to be crashing a lot. When you install a new program, the computer mysteriously tells you that it has found previously installed components—even though the components appear to have different creation dates and sizes. Do you want to keep them or overwrite them? All of these are symptoms of OS decay, and no one, not even IBM or Microsoft, seems to be doing anything about it.

The problem is compounded by a number of factors, including slipstream upgrades, monthly modifications of ancillary miniprograms, unstable DLLs, compiler changes, and Microsoft's inability to work with communications protocols, among other things. The result is that over a period of time, the operating system begins to decay, until eventually, you have to reinstall it. Here are some anecdotes from my own encounters with OS decay.

About a week ago, for no known reason, the cursor on my Pentium/166 running Windows 95 would completely disappear from the screen. If I Alt-Tabbed through all other open programs, eventually returning to the screen from which the cursor disappeared, it would reappear and everything seemed fine. Nevertheless, it's very annoying and I can't figure out what I installed that causes it.

I should add here that when you try to fix something in Windows 95, it requires an inordinate number of reboots. Whatever happened to the promise that everything would work "on-the-fly" with Windows 95? But I digress.



BIODEGRADABLE

Over time, operating systems begin to decay. No one seems to be doing anything about it.

Then there's the weird, unreplicable phenomena. For example, on the Cyrix P166+ preinstalled with Win 95, the little menu bar at the bottom of the screen, when set to "Auto hide," slides up with a smooth scrolling motion that looks ultra cool. On all the other systems I've seen, it pops up. I haven't been able to find anyone who knows how to duplicate this and I suspect it's caused by a slipstream upgrade or something embedded in another application.

A slipstream upgrade, for those of you who haven't heard the term before, refers to a "minor" upgrade—typically a code adjustment or minor bug fix—not worth announcing. In fact, it usually requires a recompile of all the code and, in so doing, it can create entirely new bugs. This practice accounts for the phenomenon of the exact same machines working differently with what is supposedly the exact same software.

Another Win 95 problem that has rooted itself in my Pentium/166 involves the COM-port handler. After any session using a COM program, if I want to run AOL I have to initialize the program and attempt to make a connection, then reboot the session. Curiously, the session reboot takes forever and the AOL screen just hangs there for a couple of minutes before disappearing. Afterwards, AOL works fine. Well, most of the time anyway. A couple of week ago when I went through this process, I got two Windows error messages in a row. On the third attempt, AOL appeared to run fine. Eventually, this error stopped happening—for no known reason.

I should also mention that the OS/2 quirks are no less loopy. While OS/2 does not crash as routinely as Win 95, it does crash. And its communications sessions, though typically smoother than those of Win 95, do have some screwy problems, especially with OS/2 Warp Connect. With the configuration I had, if I switched between active programs at full-screen setting, Connect would lose all keyboard control. And OS/2 has the decay problem in which, after loading a number of programs, certain utilities begin to overwrite other versions to the point where some programs stop running.

I believe that this latter problem, especially with Win 95 DLLs and programs such as QuickTime for Windows (a total headache), needs to be addressed and corrected immediately. There should be either an OS management-type program that can handle multiple DLLs or a database of DLLs and associated programs that are changed from one install to the next, coupled with a utility that can archive programs to be overwritten. Finally, vendors should strive to make operating systems less dependent on overlays, DLLs, and other tricks by putting more functionality into the kernel. □

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Portable Property

PC Labs tests 58 presentation, value, and lightweight Pentium-class portable PCs to see which ones deserve a place in your briefcase.

My guiding-star always is, Get hold of portable property.

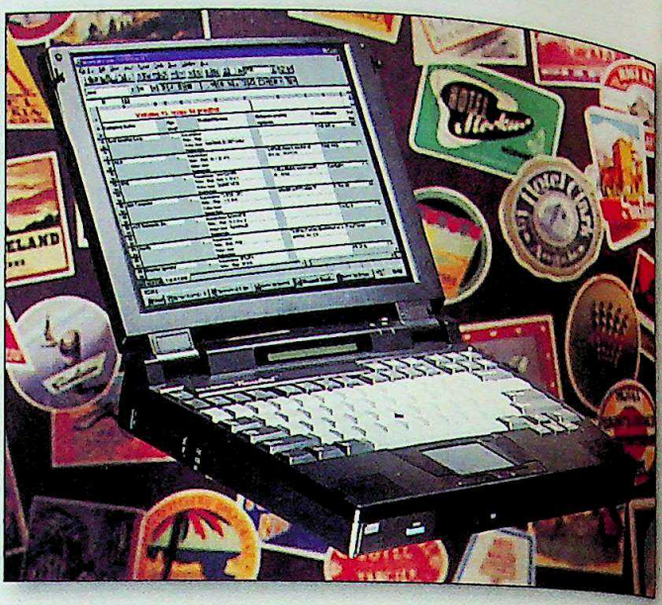
—Charles Dickens, *Great Expectations*

By Cade Metz

Dickens's guiding star may have a greater hold on the PC industry than it ever had on his nineteenth-century vagrants. As the disparity between notebook and desktop performance continues to lessen, the consumer's yen to get hold of portable property continues to escalate. Sales of portables will grow twice as fast as those of desktops this year and could account for a third of the PC market by the end of the decade. Needless to say, this trend has not been lost on the industry's major players.

Each of the top ten desktop PC vendors now sells notebooks as well. Meanwhile, Japanese giants Fujitsu and Hitachi have just entered the U.S. market with portables, not desktops, as their primary focus. Because so many companies wish to purchase all of their machines from a single source, vendors have to provide impressive notebook offerings or risk losing potential desktop customers. This realization has certainly taken hold at the industry's desktop sales leader, Compaq, which has completely revamped its notebook line after falling behind Toshiba and IBM in the mobile arena. On the flip side,

PHOTOGRAPHY BY THOM O'CONNOR



PRESENTATION NOTEBOOK If you're not willing to sacrifice performance or features on the road, the presentation notebook is the system for you, complete with SVGA display, integrated CD-ROM drive, and cutting-edge video and multimedia features. Price: $3,000 to $7,000.



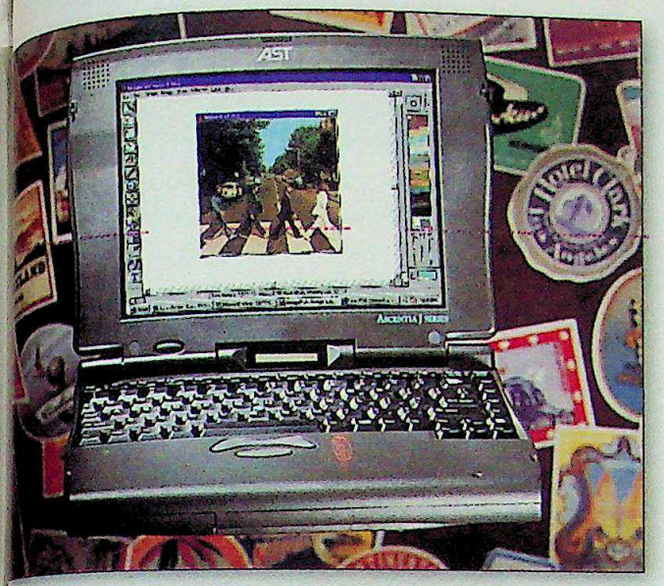
LOW-END VALUE NOTEBOOK If you're on a budget, consider the low-end value notebook class. Systems are typically equipped with dual-scan displays, 100-MHz Pentium CPUs, and 770MB hard disks but may not have a CD-ROM drive option. Price: $2,300 to $3,700.

IN THIS REVIEW

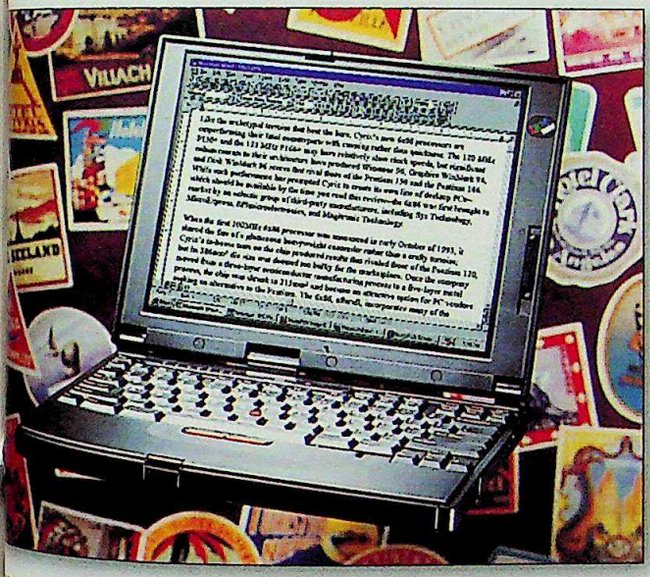
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GH-END VALUE NOTEBOOK You'll find many of the high-end features the presentation-class notebook in this category, including 11-inch d larger displays and CD-ROM drives, although you may sacrifice ne leading-edge video and design features. Price: $2,700 to $5,000.



HTWEIGHT NOTEBOOK Don't let their 5-pound travel weights fool . Today's lightweight notebooks are fully loaded with 100-MHz ntium and faster processors, 770MB or larger hard disks, full-size boards, and even 12.1-inch displays. Price: $3,700 to $5,000.

data International Inc. 80
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each of the top ten portable vendors will have a desktop line after Toshiba enters the desktop market this year.

Building competitive notebooks, however, is no walk in the hardware park. While Intel provides reference designs for desktop manufacturers—including sample chip sets, motherboards, and even complete systems in some cases—vendors must rely more on their own wiles when constructing portables. Companies such as Phoenix Technologies, a BIOS maker, offer reference kits for notebooks, but they don't provide much assistance when it comes to making systems small and sturdy—two key characteristics of successful portables.

SOPHISTICATED HARDWARE

Whoever first said "you can't take it with you" did not have computer hardware in mind. Today, you *can* take it with you. You can take Pentium/133s and 12.1-inch displays, 28.8-Kbps V.34 modems and CD-ROM drives, 64-bit graphics and SVGA resolution. Notebooks are still a long way from offering the 200-MHz Pentium or the Pentium Pro—which have already reached the desktop—but many mobile shortcomings that were present just six months ago have already been erased, and several novel technologies are advancing the notebook's unique persona. Here, we examine this persona, reviewing 58 portables from 34 of the industry's leading vendors.

Six months ago we saw the fastest Pentium/120 machines outscore the Pentium/133 machines by 2 percent. This time around, the paradigm has shifted up a clock-speed generation. Of the 58 machines we review, 3 offer the Pentium/150, but the 20 Pentium/133 systems—many of which operate internally at 2.9 volts and are plugged into the new mobile Triton core logic chip set—proved to be more adept during benchmark testing. The performance of the 150-MHz systems was brought down by the chip's supporting cast. For example, one 150-MHz system used asynchronous L2 cache and DRAM instead of faster synchronous cache and EDO DRAM. As Intel releases its low-voltage mobile Pentium/150 in August and manufacturers begin to surround the chip with stronger components, you'll see more and better 150-MHz portables widely available by the end of the third quarter. Faster Pentiums that run at 2.5 volts will follow shortly thereafter, but low-voltage, "mobile" Pentium/200- and Pentium Pro–based laptops won't arrive until the end of 1997 or the beginning of 1998.

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BIGGER AND BETTER DISPLAYS

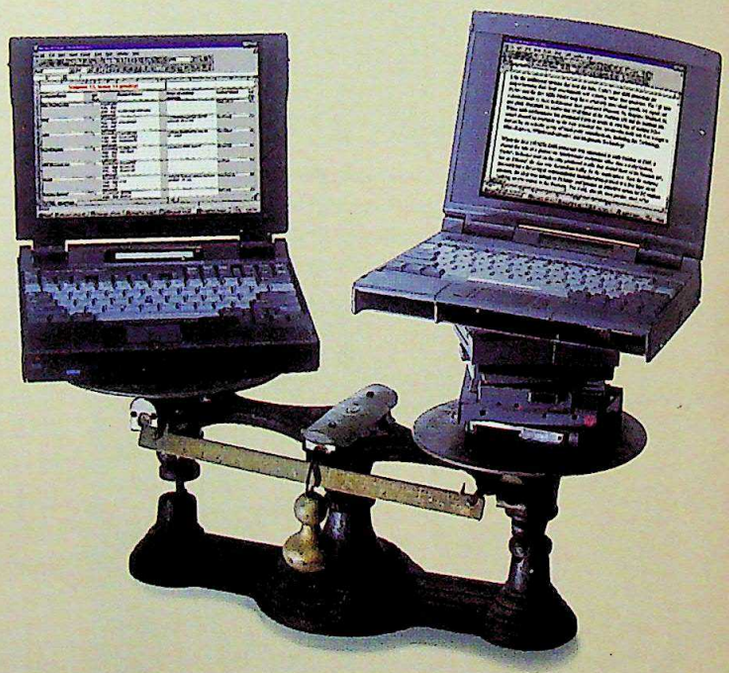
The evolution of notebook displays is equally impressive. Over two-thirds of these 58 notebooks have graduated to SVGA (800 by 600 pixels), while the Toshiba Tecra already offers XVGA (1,024 by 768 pixels) on its 12.1-inch display. Although the Tecra's implementation is adequate, the XVGA display of the Sharp PC-9080—released in July but not reviewed here—delivers a much more refined resolution via Super-High Aperture, a technology that increases brightness, provides a higher color ratio, and betters power consumption.

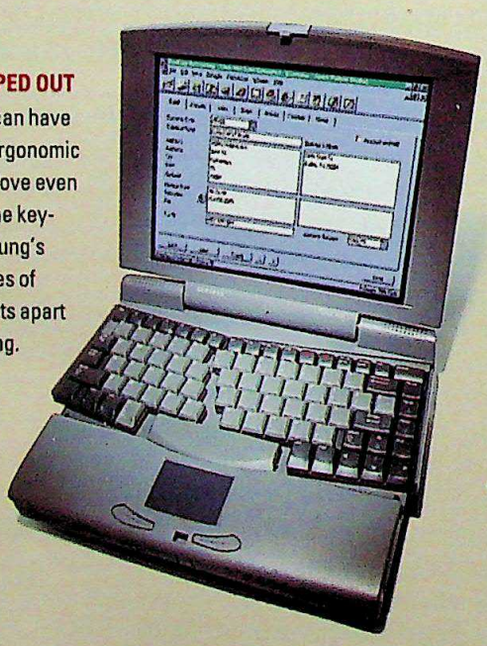
As early as next year, the crème de la crème will have stretched displays to 13.8 inches, which may be the end point for truly portable portables: The notebook would be a minimum of 9 by 12 inches if the bezel is half an inch wider than the display. Vendors moving toward bigger displays may make their systems thinner to keep the overall volume constant; we expect to see one or two subnotebook systems (sans floppy disk drive) that are less than an inch thick by year's end.

After being the norm for such an extended period of time, 32-bit graphic chip sets are slowly being displaced. With ten reviewed systems using Chips and Technologies' 64-bit 65550 chip set, three using Trident's 64-bit Cyber chip set, and Dell's two machines leapfrogging to NeoMagic's

Picks and Pans: Pentium Notebooks

Here are some of the notable innovations and questionable design choices we found among this crop of 58 notebooks.

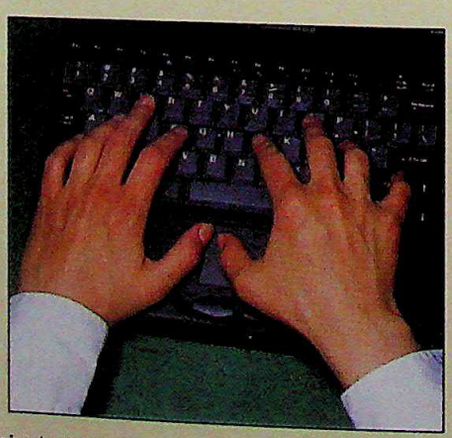




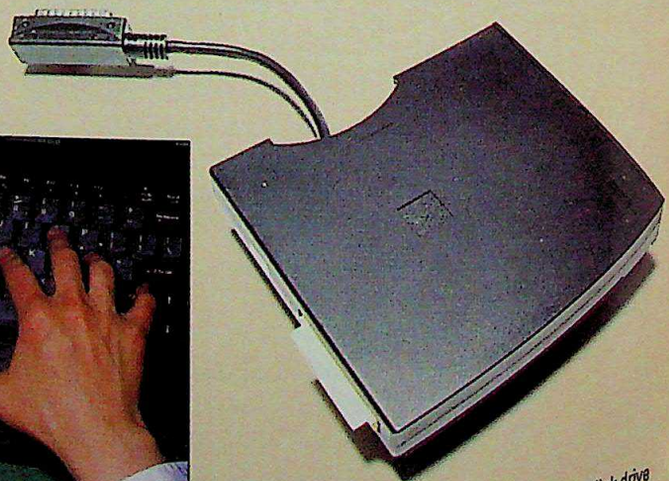
FLIPPED OUT You can have the ergonomic keyboard you love even on the road: The keyboard in Samsung's SENS 810 series of notebooks splits apart for easier typing.

LOAD 'EM UP The Micron Millennia TransPort and the Unisys Aquanta MN provide about the same functionality, but you'll need a pretty big briefcase if you want to take all of the Aquanta's components with you.





IT'S A REACH If you're a touch-typist, look for a notebook with a touch pad that's slightly left of center (directly below the G and H keys), because otherwise, you'll be performing uncomfortable hand gymnastics.



GET CONNECTED The floppy disk drive in HP's OmniBook 5500 series has an external connector, so you can use the floppy disk and CD-ROM drives simultaneously—an added convenience.

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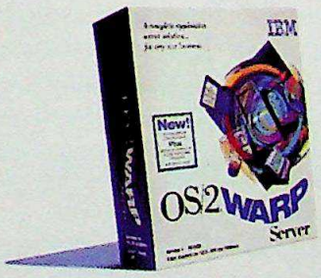
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128-bit MagicGraph NM2070, *almost* should become *definitely* by the end of the year. NeoMagic has already pushed the high end even further by supplying both Dell and Sharp with the new MagicGraph128V, which adds EDO memory and video acceleration.

OF DISKS AND CACHES

Like CPUs and displays, hard disks are enjoying their own steady increase in capacity. Currently, 12.7-mm drives can store 810MB of data, while 17-mm drives have risen to 1.2GB. In the coming months, however, 19-mm hard disks will reach upwards of 2.1GB, and shorter 12.7-mm drives will offer 1.4GB of storage; the end of 1997 could see at least one vendor reaching 5GB of capacity.

Last year many vendors indicated they would drop external caches as they adopted EDO DRAM. Actually, the opposite has happened. A year ago, only a quarter of the machines we tested used an L2 cache. In this review, despite a secondary cache's tendency to use up both space and power, only nine machines did without it, and their performance suffered accordingly. More than one-third of the reviewed machines have EDO DRAM.

CD-ROM DRIVES COME ON STRONG

Whether they're integrated, part of a docking station, or an option that can be swapped for a floppy disk drive or battery, CD-ROM drives showed up in all but 12 of the reviewed machines. The de facto standard for this lot is 4X, but the Gateway Solo S5-120 and S5-133, the Micron Millennia TransPort, and the Toshiba Satellite Pro 420CDT and Tecra 720CDT already have 6X drives.

One of the most intriguing trends is modularity. Almost half of the reviewed units contain a bay that can accommodate a supplemental battery, floppy disk drive, or CD-ROM drive, or a second hard disk. As your needs change, you can swap hardware in and out without serious exertion.

Among pointing devices, the touch pad was used by 44 reviewed machines. Ten systems had pointing sticks, but those 10 include the top three sellers: Toshiba, IBM, and Compaq. Now that IBM has agreed to license its current TrackPoint technology to other vendors, the pointing stick could become more prevalent; until now, IBM licensed only past versions of the technology. Trackballs have all but disappeared from the scene.

Presentation:
IBM ThinkPad 760ED
Micron Millennia TransPort

Lightweight:
IBM ThinkPad 560

High-end value:
Austin Edge CD
AST Ascentia J50

Low-end value:
WinBook XP5 P100

One of the Editors' Choices in the presentation category is no stranger to the winner's circle: the $6,999 IBM ThinkPad 760ED. Since the ThinkPad 700 series was introduced over three years ago, it has won many Editors' Choice awards because of its cutting-edge components and great performance. The latest member of the 700 series is no exception to the rule. Powered by a Pentium/133 CPU, this portable was the top performer in this roundup on our Winstone tests. In addition to its nearly 3-hour battery life, it is the only system here to offer NTSC video-*in* as well as video-out.

Our other presentation-class Editors' Choice goes to the Micron Millennia TransPort. This machine marks Micron's entry into the notebook market, and it's a winner in every respect. Not only does the TransPort offer all the features you'd expect from a PC of this caliber—including a 12.1-inch active-matrix display and a 6X CD-ROM drive—it sells for only $5,198.

In the lightweight category, our Editors' Choice goes to a notebook that breaks new ground in the under-5-pound class: the $3,749 IBM ThinkPad 560. This Pentium/120 PC has the same footprint as a full-size notebook—which allows space for a 12.1-inch active-matrix display and a full-size keyboard—but it's only 1.3 inches thick and weighs only 4.8 pounds (travel weight).

Our two Editors' Choices in the high-end value class go to the $3,499 AST Ascentia J50 and the $4,171 Austin Edge CD. The Ascentia J50 is a great choice if you don't need a CD-ROM drive: This Pentium/133 portable was a top-notch performer in its class, and it offers a lithium ion battery as well as an integrated 14.4-Kbps fax modem. If you do need a CD-ROM drive, the 133-MHz Austin Edge CD should fill the bill. This machine offers a 4X CD-ROM drive, a stunning 11.4-inch active-matrix display, a 1.3GB hard disk, and nearly 4 hours of battery life.

Our low-end value Editors' Choice goes to the WinBook XP5 P100. Priced at only $2,599, this PC features a Pentium/100 CPU, a 10.4-inch dual-scan VGA display, and an integrated 14.4-Kbps modem. Add to this close to 4 hours of battery life through its lithium ion battery pack and you have a great portable PC for a reasonable price.

We also award an honorable mention to the low-end value $3,459 Dell Latitude XPi P100SD. This Battery-Mark champion had a time of 4:52.

BATTERY POWER

As these improvements are made, the only casualty is the battery. Battery capacity is increasing by about 10 percent every year, but the rate of system power consumption is growing faster. Half of the vendors in this review have gone to lithium ion batteries, but adoption has been slow, mainly thanks to short supply. Currently only a few vendors, including Sony and Matsushita, produce lithium ion batteries in quantity. While lithium costs more than nickel hydride, it provides more charge per pound and can offer more charge cycles during its lifetime.

The battery, however, may be less important than it's made out to be. Vendors say that nine out of ten notebook users

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end most of their time plugged into an C outlet and usually use battery power r no more than an hour at a time.

On the brand-name front, Duracell ntinues to have little success selling its ndardized NiMH battery sizes.

OMED PORT VIDEO, CARDBUS

yond the necessities, notebook vendors ve also added several novel compo- nts over the past year that are designed make mobile life easier—or at least a le more intriguing. Many of these tech- logies have yet to be widely imple- nted, but most should be more preva- t by the end of the year.

In terms of both technology and sales, oshiba is on top of the industry. Its 20 per- nt market share comes close to matching e combined share of its two true chal- gers, IBM and Compaq, while its Tecra CDT machine is redefining the note- ok ideal in ways matched only by the M ThinkPad 760ED. With a 10.3-pound vel weight (system, battery, and trans- rmer), the Tecra is the heaviest machine re, a full 2 pounds heavier than the inkPad 760ED, but it has brought sever- heretofore unseen features to the mar- t. Most notable is Zoomed Port Video PV), a PC Card spec that will certainly row the multimedia gap between note- oks and desktops. The port—which will cept MPEG, television feeds, or video- nferencing signals via ZPV cards—intro- duces a high-speed connection from a PC Card slot to the notebook's audiovisual hardware by sidestepping the system bus. The end result is simply higher-quality full-motion video playback.

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Although no ZPV cards were available and ZPV was offered only on the Tecra as we went to press, Toshiba and its supporters (Cirrus Logic, Sigma Designs, Sony, and Texas Instruments) are lobbying to have the architecture adopted as a PC Card standard. Independently, Compaq is planning to offer ZPV this summer on its new notebook, the Armada, and NeoMagic is adding support for it to its MagicGraph-128ZV graphics chip set shortly thereafter.

The Tecra also includes CardBus support, a second PC Card extension waiting for adoption. While the existing 16-bit PC Card interface provides acceptable modem and 10-Mbps LAN connectivity, it can't accommodate such technologies as 100-Mbps Fast Ethernet or high-speed SCSI, and it is hopelessly slow for RAM expansion. With the 32-bit CardBus interface, however, you may soon be running 100-Mbps network technologies through hardware the size of your credit card. NEC will join Toshiba with CardBus support in its new Versa 6000, planned for release by the time you read this.

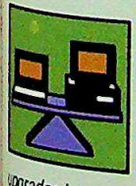
FAST TRANSFERS

The 28.8-Kbps modems integrated into the Tecra, the IBM ThinkPad 760ED, and the Polywell Poly 500NB5 perform standard voice, fax, and data functions, and they also let you use these systems as answering machines and full-duplex speakerphones. The Tecra modem also provides cellular phone support, as do 29 of the other machines that we tested.

Infrared support is even more prevalent. Only six machines lacked infrared interfaces that adhered to the 115.2-Kbps standard specified by the IrDA (Infrared Data Association). With these wireless interfaces, you can live out your "Star Trek" fantasies by sending jobs to compliant printers or exchanging files with your desktop system at a distance of several yards.

HIGHLIGHTS

Pentium-Class Notebooks



Notebooks now account for almost 30 percent of all PC sales, leading to increasingly fierce competition among the elite manufacturers and rapid upgrades in portable technologies. To help end users navigate this fast-changing industry, we categorize today's notebooks into four classes: ***presentation systems,*** *for mobile exhibitors who require SVGA displays and integrated CD-ROMs;* ***lightweight*** *systems, with travel weights of less than 5 pounds;* ***high-end value*** *machines offering active-matrix displays while allowing buyers to weigh performance against price; and* ***low-end value*** *portables, which also offer a price/performance trade-off but have dual-scan displays.*

SVGA resolution has become mainstream: Of the 58 machines we tested, 52 have graduated to 800-by-600 resolution; one, the Toshiba Tecra 720CDT, offers a 1,024-by-768 XVGA display. In this review, 12 displays were roughly 12 inches along the diagonal, 19 were roughly 11 inches, and 27 were roughly 10 inches.



CD-ROM drives, while not always integrated, are available in some form on most notebooks. Many vendors allow you to plug into multimedia docking stations, but the increased use of modular bays has made CD-ROMs more mobile. Such bays allow you to swap various components—including batteries, floppy drives, hard disks, and MPEG decoders as well as CD-ROM drives—in and out of the same space. The standard speed for mobile CD-ROMs is currently 4X, but 6X drives will become prominent by the third quarter of this year.



A wave of new mobile technologies has also gripped the industry over the past year. The Tecra now offers Zoomed Port Video (ZPV), which can speed up multimedia presentation, and CardBus, which will let mobile users tap into such technologies as Fast Ethernet and high-speed SCSI via a 32-bit PC Card interface. Meanwhile, 52 reviewed systems provide infrared ports for data transfer, and 16 machines allow users to connect to standard TV screens. While PC Card modems are still the most prevalent connectivity devices, eight machines offer integrated modems—two of which contain a DSP for answering-machine and speakerphone functions.

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The IrDA has just released a Version 1.1 spec that raises speeds to 4 Mbps—called Fast-IR, or FIR—but such speeds are not available from the machines reviewed here. Now that both OS/2 and Windows 95 have 4-Mbps support, however, vendors will soon be upgrading their interfaces. NEC and Sharp have already announced FIR support for their respective Versa 6000 and PC-9080 portables.

Lastly, 16 reviewed machines came equipped with NTSC (National TV Standards Committee) video-out ports (also known as *scan converters*), which allow mobile users to send notebook presentations to standard television screens. This is particularly appealing to mobile presenters who find themselves in a conference room with a television but not a PC projection system or a VGA monitor. One notebook, the ThinkPad 760ED, lets you reverse the process and bring video in.

PENTIUM NOTEBOOKS

How to Read the Suitability to Task Boxes

Suitability to Task

Scores reflect how well a product fares for particular types of functions or operations. These ratings do not take the prices into account. From best to worst, the possible ratings are *excellent, good, fair,* and *poor.*

The **desktop replacement** rating indicates how well each notebook serves as a substitute for a desktop PC. Factors contributing to this rating include display resolution and size, performance, and the availability of a docking station or port replicator.

The **road warrior** rating indicates how well the notebook is suited for prolonged use on the road. Key factors are battery life, travel weight, case dimensions, performance, screen size, keyboard, and the inclusion of an integrated fax modem.

Service & Reliability

Ratings are included for vendors that received at least 50 responses on our latest Service & Reliability poll of 17,000 subscribers. These results reflect readers' experience with notebooks from a given vendor. For details, see our July 1996 issue.

The **reliability** rating is a measure of respondents' satisfaction with the reliability of the vendor's notebooks in use over the past two years.

The **repair** rating is a measure of respondents' satisfaction with the repair service provided by the vendor for notebooks in use over the past two years.

The **technical support** rating is a measure of respondents' satisfaction with the vendor's support for machines in use over the past two years.

The **percent needing repair** rating is a measure of the proportion of notebooks that the respondents indicated needed repair during the past year.

REVIEW CRITERIA

To participate in this review, each system had to offer a Pentium-level CPU. All but one machine arrived with the Pentium itself; the Canon Innova 360CD is built around AMD's Am5x86-P75.

Each system also had to come with a color screen, Windows 95, a minimum 720MB hard disk, 16MB RAM, and a modem. On the road, modems are now a necessity—for remotely accessing your desktop, for e-mail, and for faxing. Eight of the machines under test, in fact, have forsaken removable PC Cards for integrated modems.

As in previous reviews, we use several categories to evaluate systems under test; each notebook is judged only against others in its category. In this particular roundup, we define four categories:

- presentation;
- lightweight;
- high-end value;
- low-end value.

Systems in the *presentation* class—which are most appropriate for the nomadic pitchman—had to have an SVGA active-matrix display and an integrated CD-ROM drive. We asked vendors to send machines with the fastest CPU available, as well as the largest screen and hard disk. Price was considered, but it did not weigh heavily in this category. Twenty-one machines fell into this category, ranging in price from $3,000 to $7,000.

Since last summer's roundup, the word *subnotebook* is used with less frequency. The term—which refers to a system that forgoes an integrated floppy disk drive for greater portability—has been forsaken by some vendors in favor of such terms as *ultraportable* and *slimline*. We are opting for *lightweight*. To be included in this category, a system simply had to have a travel weight of less than 5 pounds, not including external floppy disk drive.

The *high-end value* class includes machines with active-matrix TFT displays, while the *low-end value* machines have dual-scan screens. The 13 low-end machines deliver modest performance with modest components (typically a 10.4-inch VGA display, nickel hydride battery, and 770MB hard disk) at modest prices ($2,000 to $4,000). Naturally, the 18 high-end machines provide slightly greater performance and slightly more appealing hardware (11.3-inch SVGA screens, 1GB+ hard disks) but are tagged with slightly steeper prices ($3,000 to $5,000). In the high-end class, as in the presentation class, we emphasized high-end features such as TFT displays and speedy CPUs. But price is weighed much more heavily in this category; so while you will see a crossover in features between high-end and presentation, you may not see absolute leading-edge features in the high-end value notebooks.

THE CHOICE IS YOURS

In the reviews that follow, you'll find notebooks that represent all that's available in the market today, from sub-$2,000 value machines to fully loaded, $6,000+ presentation machines that rival the best of today's desktops in terms of features and performance. We're certain that no matter your budget, you'll find a Pentium-class portable within these pages.

Our Contributors: CADE METZ is a staff writer at *PC Magazine*. ROBERT S. ANTHONY is a senior writer at *PC Magazine*. FRANK J. EVANS and CHARLES LIN are freelance writers, and BRUCE BROWN is a contributing editor of *PC Magazine*. MARY E. BEHR and ANUSH YEGYAZARIAN are staff editors at *PC Magazine*. CAROL VENEZIA was the associate editor in charge of this story, and RICHARD FISCO was the project leader.

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Price/Performance Index: Pentium Notebooks

In our presentation category, IBM tops the performance/features list with the Editors' Choice–winning, $6,999 ThinkPad 760ED. It boasts a 12.1-inch active-matrix display and 4X CD-ROM drive, plus best-of-roundup results on several tests. Close in features but well behind in price is another Editors' Choice, the $5,198 Micron Millennia TransPort offering a 12.1-inch TFT display, a 1.2GB hard disk, a 6X CD-ROM drive, and great performance.

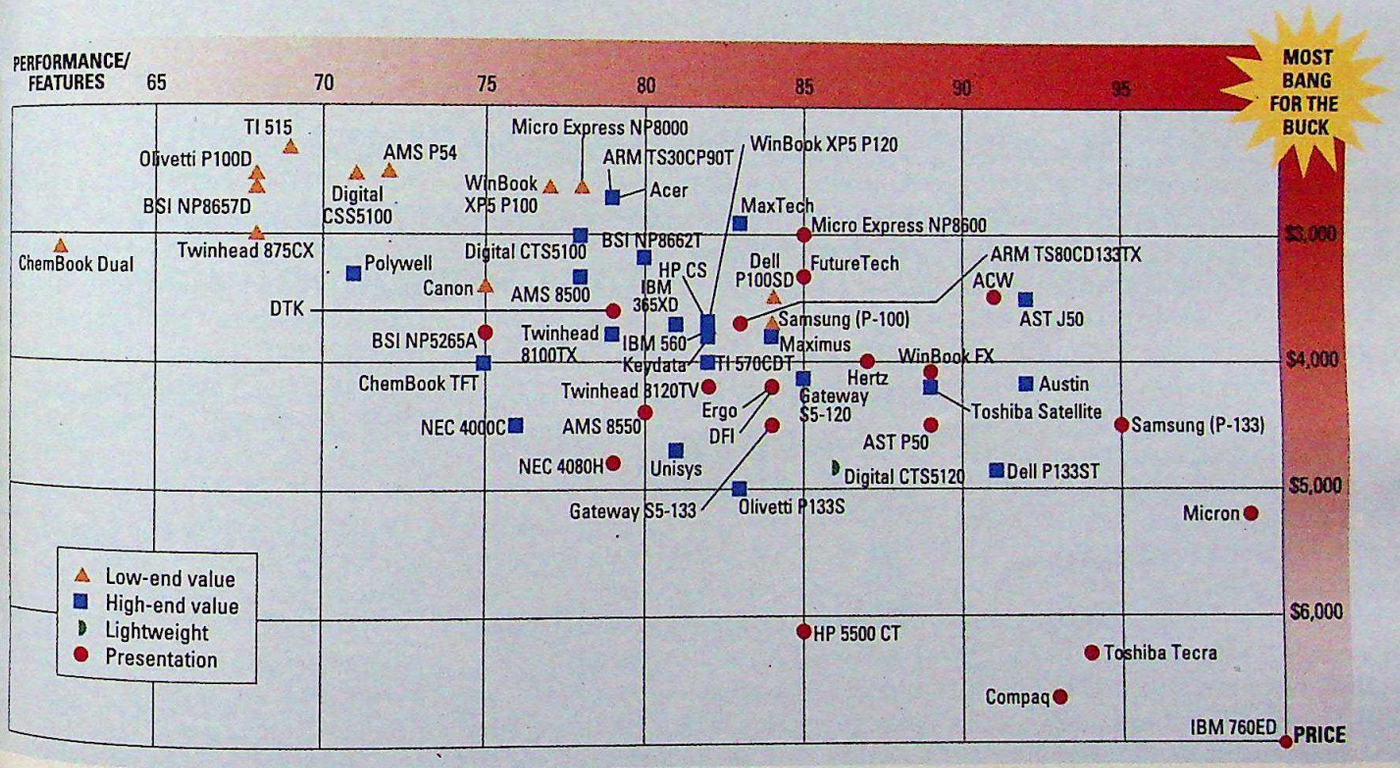
Our two Editors' Choices in the high-end value category also stand out here: AST Computer's $3,499 Ascentia J50 and Austin's $4,171 Edge CD. The Ascentia J50 boasts a lower price and longer warranty than the Edge CD; however, it has a 10.4-inch screen, a 774MB hard disk, and no CD-ROM drive, whereas the Edge CD has an 11.4-inch display, a 1.3GB hard disk, and a 4X CD-ROM drive.

Of the two lightweights, IBM's 4.8-pound, $3,749 ThinkPad 560, an Editors' Choice, has the better price, but Digital's 4.7-pound, $4,799 HiNote Ultra II CTS5120 holds the performance edge.

THE DATA POINTS

Benchmark test scores account for about 40 percent of the performance/features score. Display technology, screen size, and maximum external resolutions supported make up over 15 percent. Service and support policies and other features account for the rest of the score.

Data is available in the Hardware Library of the Editorial Forum on PC MagNet under 14BANG96.TXT, and on the World Wide Web at *http://www.ziff.com/~pcmag/pclabs/pclabs.htm.*



cer America Corp.

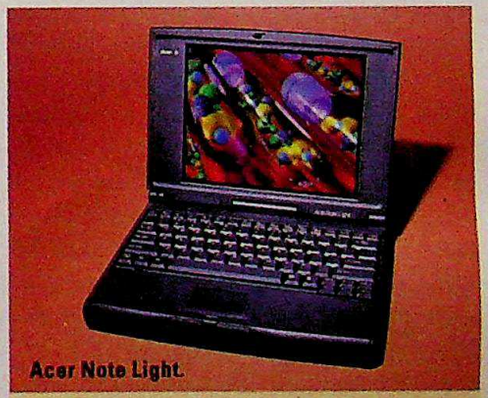
cer Note Light

Acer America Corp.'s Acer Note Light is a 100-MHz Pentium-based notebook intended for busy business travelers who don't want the added weight of an internal CD-ROM drive. With its $2,699 street price, it should also appeal to the consumer market. The Acer Note Light has a 6-pound travel weight and comes with a 10.4-inch active-matrix SVGA display driven by Chips and Technologies' 65545 graphics chip set with 1MB DRAM, a 774MB hard disk, and a nickel hydride battery that gives it a competitive operating time. The unit is similar to the TI Extensa 515 (reviewed separately).

One of the major factors that keep the Acer Note Light's performance mostly below average among the high-end value notebooks is the lack of an external processor cache. The Acer motherboard with an ALI chip set came with EDO DRAM, but the absence of an L2 cache held the Note Light to below-average results

SERVICE & RELIABILITY

Acer America Corp.	
Reliability	Average
Repair	Average
Technical support	Average
Percent needing repair	Average


Acer Note Light.

SUITABILITY TO TASK

Desktop replacement	Road warrior
Fair	Good

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across most of our benchmark tests. Its only average score was on our Disk WinMark 96 tests.

Many of Acer's intended customers won't mind sacrificing ultrafast performance, because they'll be enjoying long battery life: The Note Light ran for 2:59 on our BatteryMark test.

Acer's software bundle includes Sidekick 95, Quicken 96 Special Edition, and Hoyle Classic Games. — *Bruce Brown*

Acer Note Light. Street price: $2,699. Acer America Corp., San Jose, CA;http://www. acer.com/aac. *(Indian partners Mahendra Electronics, New Delhi; Wipro-Acer, Bangalore.)*

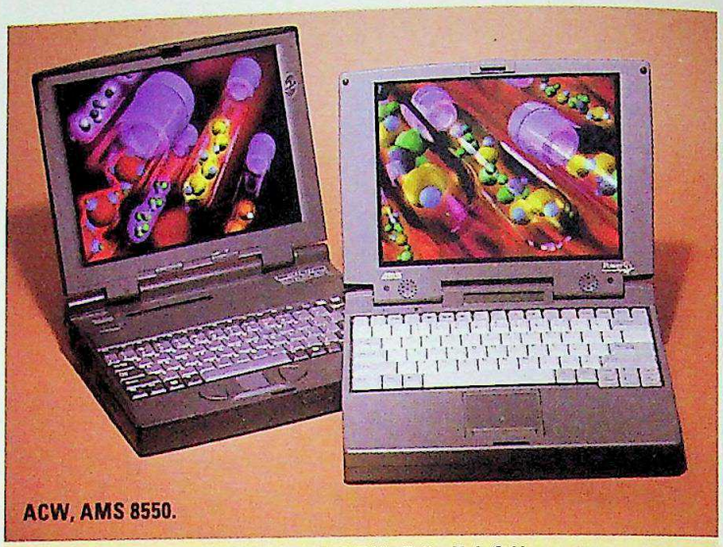
All Computer Warehouse

ACW ND5123T

Targeted at the power users within the corporate, government, and education markets, All Computer Warehouse's ACW ND5123T ($3,489 direct) is set for presentations, with a detachable 12.1-inch active-matrix NEC SVGA screen. The Pentium/133-based unit includes a 1.3GB Toshiba hard disk and a TEAC 4X CD-ROM drive. This ACW machine is similar to FutureTech's FutureMate 5813T, reviewed in this issue.

Weighing in at 8.5 pounds with battery and AC adapter, the ACW notebook is based on a Dual Technology motherboard and an SiS corelogic chip set. The notebook's impressive benchmark test performance is due in part to its 256K of pipelined-burst L2 cache and a combination of 2MB of EDO DRAM and Chips and Technologies' 65550 graphics chip set. The ND5123T's fast video memory boosted it to above-average scores on the Graphics WinMark 96 and the Winstone 96 tests. The system posted average Disk and CD-ROM WinMark 96 scores and average CPUmark scores. On our BatteryMark test, its nickel hydride battery lasted 1:28.

ACW bundles Microsoft application and entertainment software.—*BB*



ACW, AMS 8550.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
ACW ND5123T	Good	Good
AMS PowerCD 8500	Good	Fair
AMS PowerCD 8550	Good	Fair
AMS SoundPro P54	Fair	Fair

ACW ND5123T. Direct price: $3,489. All Computer Warehouse, City of Industry, CA; acw@netvoyage.net. *(No Indian partner.)*

AMS Tech

SoundPro P54, PowerCD 8500, PowerCD 8550

AMS has a notebook for every need. Its low-end value machine, the $2,480, 7.7-pound Pentium/100-based SoundPro P54, offers a 10.4-inch dual-scan VGA display for basic on-the-road communications and applications work. Its high-end value unit, the $3,325, 8.5-pound Pentium/120-based PowerCD 8500, with a 10.4-inch active-matrix SVGA screen, is for mobile corporate users who demand high-end multimedia capabilities. Finally, its presentation notebook, the $4,395, 8.8-pound Pentium/133-based PowerCD 8550, features an 11.2-inch active-matrix SVGA display for no-compromise computing.

The SoundPro uses an AMS motherboard with an ACC Micro chip set and 256K of asynchronous L2 cache, which contributed to below-average CPUmark scores. The Toshiba 776MB hard disk aided it in achieving an average Disk WinMark 96 score. The Chip and Technologies VL-Bus–based graphics chip set with 1MB DRAM contributed to a below-average Graphics WinMark 96 score. The unit posted average Winstone 96 and Winstone 32 scores. Its nickel hydride battery lasted a competitive 2:48 on the BatteryMark test.

Stepping up to the PowerCD 8500 will net you a 120-MHz CPU, an ACC chip set, 256K of pipelined-burst L2 cache, PCI graphics, and the same hard disk as in the SoundPro. This unit also has a 2X CD-ROM drive. The system posted average CPUmark, Winstone, and Disk WinMark 96 scores. Even with 2MB of VRAM, its Graphics WinMark 96 score was below average, as was its CD-ROM WinMark 96 score. (Its 2X CD-ROM drive is the likely culprit for the last result.) The unit's BatteryMark score was 1:39.

The AMS PowerCD 8550 features a bigger display (11.2 inches), a 133-MHz CPU, a 1.3GB hard disk, and a 4X CD-ROM drive. Unfortunately, this machine posted below-average scores on most benchmark tests, including all CPUmark and Winstone measures as well as our Graphics WinMark 96 test. The 4X drive helped the PowerCD 8550 attain an average CD-ROM WinMark score; its Disk WinMark 96 score was also average. The unit was unable to run the BatteryMark test.—*BB*

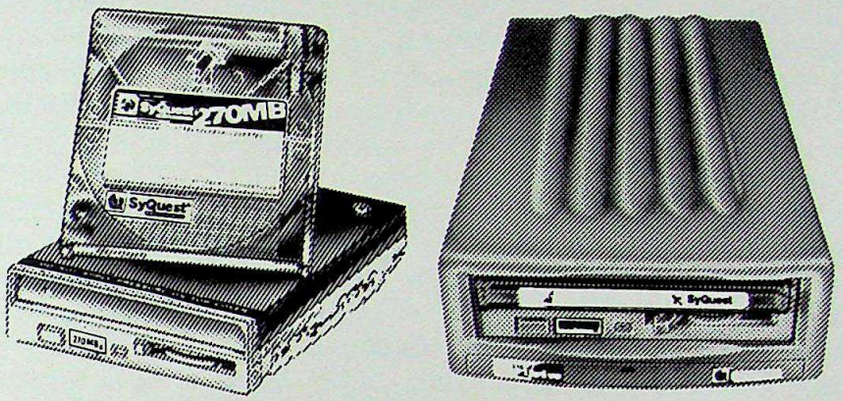
SoundPro P54. Street price: $2,480.
PowerCD 8500. Street price: $3,325.
PowerCD 8550. Street price: $4,395.
AMS Tech, Irwindale, CA; http://www.amstech.com.
(No Indian partner.)

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	SyQuest EZ 135	ZIP 100
SEEK TIME	13.5 MS	29 MS
DTR	2.4 MB/SEC.	1.24 MB/SEC.
WARRANTY	2 YRS ON DRIVE 5 YRS ON MEDIA	1 YEAR
PARTITIONS	26	NIL
MEDIA LIFE	30 YRS.	10 YRS.

DTR = DATA TRANSFER RATE

(Source : MACWORLD Dec '95 / PC Magazine Mar '96)

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Battery Life vs. Portability

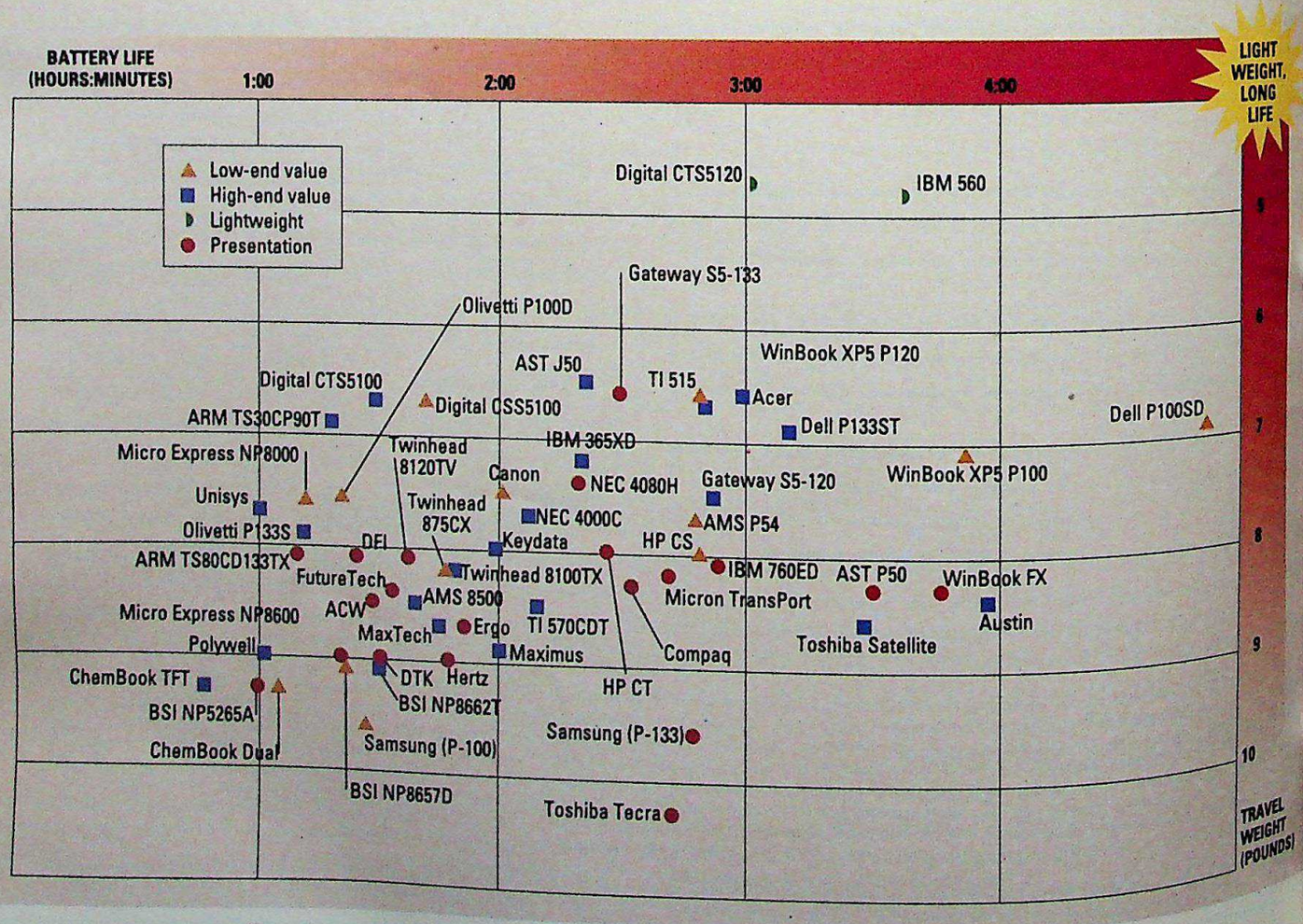
PC Magazine Labs inaugurates a new battery test this issue: the ZD BatteryMark measure, designed to simulate the way a user would realistically use a notebook. It runs complete with the periodic "think times" that occur in a real-world situation (see the PC Tech section of this issue for more detailed information on the test).

All of the top performers on this new test used lithium ion batteries. But in terms of battery life, the clear champ is the Dell Latitude XPi P100SD, an honorable mention in this roundup. This portable kept on ticking for nearly 5 hours—which should be more than enough to last through a cross-country flight under a normal-usage scenario.

The $3,459 Pentium/100-based Dell Latitude XPi P100SD, which weighs in at only 6.9 pounds equipped for the road, combines many of today's most sought-after components with aggressive power management features. This system (as well as Dell's other entry, the Pentium/133-based Latitude XPi P133ST) features a well-integrated set of low-power components, including NeoMagic's 128-bit MagicGraph NM2070 graphics chip set, to reduce overall power consumption for longer battery life. The unit also offers 256K of synchronous L2 cache and 16-bit audio, as well as a 10.3-inch SVGA dual-scan display and a 773MB hard disk.

There were only two lightweight notebooks in this roundup: the $4,799 Digital HiNote Ultra II CTS5120 and the $3,749 IBM ThinkPad 560. The ThinkPad 560, our lightweight Editors' Choice, lasted half an hour longer (3:38) than the HiNote Ultra II's respectable 3:02. The IBM, weighing only 4.8 pounds (travel weight) and measuring 1.3 inches thick, offers a beautiful 12.1-inch active-matrix SVGA screen and a 774MB hard disk. The Digital unit weighs a bit less (4.7 pounds) and has a bigger hard disk (1GB), but its TFT display measures 10.4 inches diagonally.

Among presentation notebooks, the leader, the $4, 079 WinBook FX, ran for 3:46 on our BatteryMark test. The closest competitor was the $4,499 AST Ascentia P50, which ran for 3:30. All other presentation notebooks were sub-3-hour performers. These two books (as well as the Editors' Choice Austin Edge CD) are made by the same parent company, Quanta Computer Systems, and offer many of the same perks: Pentium/133 processors, EDO DRAM, Toshiba hard disks, TEAC 4X CD-ROM drives, and 11.3-inch active TFT screens.—*Analysis written by Mary E. Behr*



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	Travel weight (pounds)	Main battery weight (pounds)	ZD Battery Mark (hours:minutes)	Battery life per pound of battery weight (hours:minutes)
W-END VALUE				
MS SoundPro P54	7.7	1.4	2:48	2:00
ST NP8657D	9.1	1.3	1:22	1:03
shon Innova Book 360CD	7.5	1.3	2:01	1:33
amBook 5400 Dual	9.3	1.1	1:05	0:59
ell Latitude XPi P100SD	6.9	0.9	4:52	5:24
gital HiNote VP CSS5100	6.7	1.0	1:42	1:42
P OmniBook 5500 CS	8.0	0.9	2:49	3:08
icro Express NP8000-P120	7.6	1.0	1:12	1:12
vetti Echos P100D	7.5	1.1	1:21	1:14
msung SENS 810 (P-100)	9.6	1.3	1:27	1:07
Extensa 515	6.6	1.1	2:49	2:34
winhead Slimnote 875CX	8.3	0.7	1:47	2:33
nBook XP5 P100	7.1	1.0	3:52	3:52
GH-END VALUE				
ser Note Light	6.6	1.1	2:59	2:43
MS PowerCD 8500	8.5	1.0	1:39	1:39
RMNote TS30CP90T	6.9	0.9	1:18	1:27
ST Ascentia J50	6.5	1.0	2:21	2:21
ustin Edge CD	8.4	1.2	3:57	3:18
SI NP8662T	9.1	1.3	1:30	1:09
amBook 5400 TFT	9.3	1.1	0:46	0:42
ell Latitude XPi P133ST	6.9	0.9	3:09	3:30
gital HiNote VP CTS5100	6.7	1.0	1:29	1:29
teway Solo S5-120	7.5	0.9	2:52	3:11
M ThinkPad 365XD	7.2	1.0	2:20	2:20
ydata Keynote GT	8.0	0.9	1:59	2:12
ximus MediaNote CD Book	8.9	1.2	2:00	1:40
exTech YesBook Model X753	8.7	1.3	1:45	1:21
EC Versa 4000C	7.7	0.6	2:07	3:32
vetti Echos P133S	7.9	1.0	1:11	1:11
lywell Poly 500NB5	9.0	1.1	1:01	0:55
Extensa 570CDT	8.5	1.3	2:09	1:39
shiba Satellite Pro 420CDT	8.6	0.8	3:28	4:20
winhead Slimnote 8100TX	8.2	0.7	1:49	2:36
nsys Aquanta MN	7.7	0.7	1:00	1:26
nBook XP5 P120	6.7	1.0	2:50	2:50
GHTWEIGHT				
gital HiNote Ultra II CTS5120	4.7	0.7	3:02	4:20
M ThinkPad 560	4.8	0.7	3:38	5:11
ESENTATION				
CW ND5123T	8.5	1.1	1:28	1:20
MS PowerCD 8550	8.8	1.0	N/A	N/A
RMNote TS80CD133TX	8.1	0.7	1:09	1:38
ST Ascentia P50	8.3	1.2	3:30	2:55
SI NP5265A	9.3	1.1	0:59	0:53
mpaq LTE 5300	8.3	1.4	2:32	1:49
I 7200TC	8.1	0.7	1:24	2:00
X OTN-5P120C	9.0	1.3	1:30	1:09
go CD-PowerBrick	8.7	1.3	1:51	1:25
ureMate 5813T	8.4	1.1	1:33	1:25
teway Solo S5-133	6.6	0.9	2:29	2:46
rtz Z-Optima NB P150c	9.0	1.3	1:47	1:22
P OmniBook 5500 CT	8.0	0.9	2:26	2:42
M ThinkPad 760ED	8.1	0.7	2:53	4:07
icro Express NP8600-P120	9.0	1.3	1:20	1:02
cron Millennia TransPort	8.3	1.0	2:41	2:41
EC Versa 4080H	7.4	0.6	2:19	3:52
msung SENS 810 (P-133)	9.6	1.3	2:47	2:08
shiba Tecra 720CDT	10.3	1.3	2:42	2:05
winhead Slimnote 8120TV	8.1	0.7	1:37	2:19
nBook FX	8.3	1.2	3:46	3:08

N.A.—Not applicable: This product could not perform the ZD BatteryMark test.

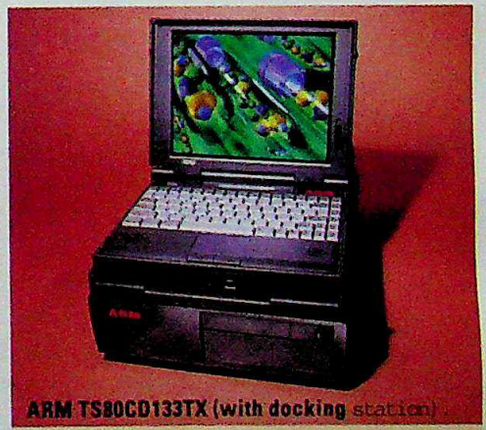
ARM Computer Inc.

ARMNote TS30CP90T; ARMNote TS80CD133TX

ARM Computer has two solid choices for the corporate customer. The ARMNote TS30CP90T, a Pentium/90-based high-end value unit with a 6.9-pound travel weight, a 10.4-inch active-matrix display, and a 774MB hard disk, has a direct price of $2,699. In the presentation category, the $3,699 ARMNote TS80CD133TX offers a 133-MHz Pentium processor, a 1.3GB hard disk, and a Matsushita 4X CD-ROM drive for more demanding users. Both machines were mostly average performers on our benchmark tests, but the battery life for each is short.

The TS30CP90T, with a Compal motherboard, a VLSI chip set, and a 256K pipelined-burst L2 cache, posted average scores on most tests but dipped below average on our Disk WinMark 96 and CPUmark$_{16}$ tests. The BatteryMark score with the included nickel hydride battery was 1:18.

The TS80CD133TX, manufactured by Twinhead, is essentially the same as Twinhead's three entries in this roundup, as well as Diamond Flower Instrument's DFI 7200TC (also reviewed in this roundup). Using an SiS chip set and 256K of synchronous L2 cache, the TS80CD133TX posted average scores on our Winstone 32, Disk WinMark 96, CD-ROM WinMark 96, and CPUmark tests. The system's Cirrus Logic graphics chip set with 1MB VRAM resulted in below-average Graphics WinMark 96



ARM TS80CD133TX (with docking station)

SUITABILITY TO TASK

	Desktop replacement	Road warrior
ARMNote TS30CP90T	Fair	Fair
ARMNote TS80CD133TX	Good	Fair

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and Winstone 96 scores. The lithium ion battery lasted just over 1 hour on the BatteryMark test.

The TS80CD133TX includes two extra features of note: NTSC video-out ports and Lotus SmartSuite 96 for Windows 95. An optional docking station with two drive bays and two ISA card slots costs $499. *—BB*

ARMNote TS30CP90T. Direct price: $2,699. **ARMNote TS80CD133TX.** Direct price: $3,699. ARM Computer Inc., Milpitas, CA.
(No Indian partner.)

AST Computer

Ascentia J50, Ascentia P50

PC MAGAZINE EDITORS' CHOICE

AST Computer comes on strong with its Ascentia notebooks. At $3,499 (street), the 6.5-pound Pentium/133-based Ascentia J50, an Editors' Choice in this roundup with a 774MB hard disk and a 10.4-inch active-matrix display, is intended for users with demanding applications that require a high-performance system. It falls into our high-end value category and is similar to Austin's Edge CD and the WinBook FX, also reviewed in this roundup. The top model, the Ascentia P50, is an 8.3-pound Pentium/133-based system with a street price of $4,499. Its target market, users needing a presentation notebook or desktop replacement, will be well served by its 11.3-inch active-matrix SVGA display, 774MB hard disk, and internal 4X CD-ROM drive.

SERVICE & RELIABILITY
AST Computer

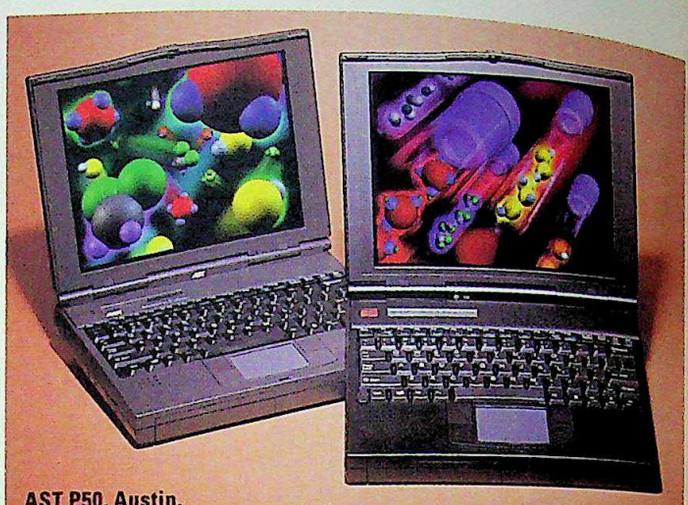
Reliability	Worse than average
Repair	Average
Technical support	Average
Percent needing repair	Average

Both AST notebooks have internal modems—a 14.4-Kbps model in the J50 and a 28.8-Kbps model in the P50; both also have lithium ion batteries. Another AST model, the Ascentia J30, not reviewed here, with the same configuration as the J50 except for a 100-MHz processor and a dual-scan screen, sells for $2,699.

The Ascentia J50's Compal motherboard with Intel mobile Triton 430MX chip set and 256K pipelined-burst cache and EDO DRAM contributed to above-average scores on every benchmark test in its high-end value category. The J50's Chips and Technologies graphics chip set with 1MB DRAM gets some of the credit for these impressive test scores. On our BatteryMark test, the unit lasted for 2:21.

The Ascentia P50 uses a Quanta motherboard with Intel's 8Z430MX chip set, 256K of L2 cache, and EDO DRAM. These components worked well for the unit, helping it to attain an above-average mark on the CPUmark$_{16}$ tests within the presentation category. It posted average scores on the Winstone 32, Winstone 96, Graphics WinMark 96, and Disk WinMark 96 tests and a below-average mark on the CD-ROM WinMark 96 measure. The P50's battery life was very impressive: 3:30 on our BatteryMark test.*—BB*

Ascentia J50. Street price: $3,499. **Ascentia P50.** Street price: $4,499. AST Computer, Irvine, CA; http:/www.ast. com. *(Indian subsidiary AST India, Bangalore; CMS, PCS-DG, Tangerine, TUL, Bombay.)*



AST P50, Austin.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
AST Ascentia J50	Good	Good
AST Ascentia P50	Good	Good
Austin Edge CD	Good	Good

Austin Computer Systems

Austin Edge CD

PC MAGAZINE EDITORS' CHOICE

The $4,171 Edge CD, from Austin Computer Systems, is a Pentium/133-based high-end value notebook with all the trimmings. One of our Editors' Choices in the high-end value category, this 8.4-pound notebook, featuring an 11.4-inch active-matrix SVGA screen, is designed for the business traveler. It is similar to the AST Ascentia P50 and the WinBook FX, also reviewed in this roundup.

The Edge CD's lithium ion battery lasted 3:57 in our BatteryMark test, proving that it's able to endure a cross-country flight on a single battery. Thanks to 256K of pipelined-burst external processor cache, the Edge's performance numbers ranged from average to slightly above average: Winstone 96, Winstone 32, CPUmark$_{16}$, and CPUmark$_{32}$ scores were above average; Graphics, Disk, and CD-ROM WinMark 96 scores were average.

Mobile professionals will appreciate the modular design of the Austin Edge CD. The floppy disk drive can be swapped out to accommodate a 4X CD-ROM drive or a second battery. (A 6X CD-ROM drive will be standard by the time this review hits the newsstand.) In case you need to swap out the hard disk regularly, the system's 1.3GB Toshiba drive can be removed easily.

The system also includes a 28.8/14.4-Kbps fax modem, which leaves both PC Card slots open for other devices. The Edge CD comes with an infrared port as well as the standard parallel, serial, and PS/2 ports.*—Charles Lin*

Austin Edge CD. Street price: $4,171. Austin Computer Systems, Austin, TX; http:// www.austindirect.com.
(No Indian partner.)

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Broadax Systems Inc.

BSI NP8657D, BSI NP8662T, BSI NP5265A

Broadax Systems offers computers for a broad range of users, from students to corporate customers. Each of the three systems reviewed here includes a PC Card V.34 fax modem and a 4X CD-ROM drive. The Pentium/75-based BSI NP8657D low-end value unit is $2,605 (street price). The Pentium/120-based BSI NP8662T high-end value unit is $3,170 and is essentially the same as the DTK DTN-5P120C and the Micro Express NP8600-P120, also reviewed in this roundup. The Pentium/150-based BSI NP5265A presentation unit is $3,765 and is the same as the Chem USA ChemBook 5400 TFT and the Polywell Poly 500NB5—also in this roundup.

The BSI NP5265A weighs 9.3 pounds, including the AC adapter. Unique among the three BSI machines are its 12.1-inch active-matrix display and a wrist rest that features an embedded touch pad and joystick. The system also includes a 1.3GB hard disk, a game/MIDI port, and an infrared port.

The NP5265A has 256K of asynchronous L2 cache; most other systems in this roundup use pipelined-burst cache, which is partly why all the NP5265A's scores were below average except the CD-ROM WinMark 96 score, which was average. The NP5265A uses a nickel hydride battery that lasted only 0:59 on our BatteryMark test, one of the shortest times of all the systems we tested.

The high-end NP8662T and the low-end NP8657D share the same case design and the same configuration of PC Card slots. The NP8662T has a 10.4-inch active-matrix display and a 1.3GB hard disk; the NP8657D uses an 11.3-inch dual-scan color display and a 772MB hard disk. Using a Duracell nickel hydride battery, the NP8662T scored 1:30 on the BatteryMark test; the NP8657D scored 1:22.

These two systems use 256K of synchronous L2 cache. The NP8662T's test scores were average except for the CD-ROM WinMark 96 result, which was above average. The NP8657D's Disk and CD-ROM WinMark 96 scores were average; its Winstone, Graphics WinMark 96, and CPUmark scores were all below average. The travel weight of each system is 9.1 pounds. —*CL*

BSI NP8657D. Street price: $2,605. **BSI NP8662T.** Street price: $3,170. **BSI NP5265A.** Street price: $3,765. Broadax Systems Inc., El Monte, CA; BSI@ earthlink.net. *(No Indian partner.)*



BSI NP8657D, Canon, ChemBook TFT.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
BSI NP5265A	Good	Fair
BSI NP8657D	Good	Fair
BSI NP8662T	Good	Good
Canon Innova 360CD	Good	Good
ChemBook 5400 Dual	Good	Fair
ChemBook 5400 TFT	Good	Fair

Canon Computer Systems Inc.

Innova Book 360CD

Canon Computer Systems' $3,369 Innova Book 360CD is the only unit in this roundup based on AMD's Am5x86-P75 processor, which runs at 133 MHz but competes with Intel's 75-MHz Pentium. Canon, known for breaking ground in 1995 with an ink jet printer–equipped notebook, markets the printerless low-end value Innova Book as a budget system for users who want multimedia functions.

The Innova Book has a travel weight of 7.5 pounds. Its features include a 10.4-inch dual-scan VGA color display, a 776MB hard disk, and integrated 16-bit FM synthesis. The 4X CD-ROM drive can be swapped for a 1.44MB floppy disk drive. A 28.8-Kbps PC Card fax modem is also included. The unit offers a docking station connection and an IrDA-standard infrared port as well as the standard I/O ports.

The Innova Book's 64-bit VL-Bus graphics subsystem is based on 1MB of VRAM and a Chips and Technologies 65545 graphics chip set. All its Winstone and CPUmark scores as well as its Graphics WinMark 96 score were below average. Its Disk and CD-ROM WinMark 96 test results were average. The unit's nickel hydride battery lasted 2:01 on our BatteryMark test.

The Innova Book comes with an extensive bundle of useful on-the-road software. —*Robert S. Anthony*

Innova Book 360CD. Street price: $3,369. Canon Computer Systems Inc., Costa Mesa, CA; http://www.ccsi.canon.com. *(Indian partners HCL-GA, Network, New Delhi.)*

Chem USA Corp.

ChemBook 5400 Dual, ChemBook 5400 TFT

Chem USA Corp.'s notebooks offer large screens but were poor performers. The $3,075 low-end value Pentium/75-based ChemBook 5400 Dual and the $4,000 high-end value 150-MHz Pentium ChemBook 5400 TFT both weigh 9.3 pounds. The notebooks are manufactured by Kapok Computer Co.; the 5400TFT has the same case design as the BSI NP5265A and the Polywell Poly 500NB5.

The 5400 Dual 75-MHz system has a Kapok motherboard based on a UMC chip set. Asynchronous L2 cache (256K) and conventional DRAM hold performance

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BENCHMARK TESTS

Pentium Notebooks

PC MAGAZINE LABS

This roundup of 58 notebooks marks the debut of some new performance-enhancing components including 128-bit graphics engines, 6X CD-ROM drives, and Intel's mobile Triton chip set. Finally, we introduce our new battery benchmark test, ZD BatteryMark.

What the Numbers Mean

ZD Winstone 96 and ZD Winstone 32 More powerful CPUs, pipelined-burst L2 cache, and faster graphics accelerators helped set records on our Winstone 96 benchmark tests. Six notebooks, all 133-MHz Pentiums, beat the old Winstone 96 record of 50, set by the HP OmniBook 5000 CTS (Pentium/120) in our last notebook roundup early this year.

In a sea of Intel processors, the low-end value Canon Innova Book 360 CD stood out with its AMD Am5x86-P75. The 5x86 is really a DX4/133: It runs internally at 133 MHz and externally at 33 MHz. Through the use of the P-rating system, AMD is able to call the chip a P75 because it provides system performance on a par with a Pentium/75 CPU. The P-rating claim holds true as the four Pentium/75 systems in this roundup had Winstone 96 scores averaging 31, while the Canon notebook posted a score of 34.

Three systems in this roundup used Pentium/150 processors: the presentation BSI NP5265A, high-end value ChemBook 5400 TFT, and presentation Hertz Z-Optima NB P150c. Many notebook manufacturers are waiting for Intel to implement its VRT (Voltage Reduction Technology) in a Pentium/150 CPU, which will allow the chip to run at a lower voltage, consume less battery power, and run cooler. The implementations of the Pentium/150 processors on the three notebooks were deficient, however, as the average Pentium/133, Pentium/120, or even Pentium/100 was able to beat the poorest performing Pentium/150 we tested on Winstone 32. The averages broke down in the following manner: The P/150s and P/100s tied at 41, the P/120s averaged 42, and the P/133s, 47.

The two Digital HiNote VP units produced unstable benchmark test results through multiple test runs. We discovered that the variances were due to Digital's implementation of Active Thermal Feedback (ATF), a feature developed by Digital in conjunction with Intel and implemented through the Intel 430MX chip set. Using a thermal sensor placed underneath the CPU, the chip set can track the CPU's temperature. If the CPU is deemed too hot, ATF will clock the CPU down to as little as one-fifth of its rated speed. Digital claims that ATF will improve system reliability over time.

Our testing showed that ATF was active at various unpredictable times during test runs, resulting in wide variances among scores (Winstone test scores varied from 17 to 39 percent). We report the highest scores achieved for each test run.

We believe that our testing does not push notebooks so hard as to produce excessive heat. We also believe that users are likely to experience performance swings with the HiNote VP units. Usage scenarios that tax the CPU heavily (such as compiling a program or rendering a 3-D image) will certainly heat up the CPU; however, both HiNote VPs produced lower scores when they had been sitting idle on AC power all night and then tested in the morning. This scenario is not unlike a system sitting on your desk plugged in all day, its CPU clocking down because of heat buildup, even when the system has been idle for most of the day.

ZD Graphics WinMark 96 and ZD Disk WinMark 96 The use of 32-bit graphics engines has long been a key stumbling block on the road to achieving desktop-level performance from a notebook. In this roundup we see not only two different 64-bit graphics chip sets but a 128-bit chip set as well. The Chips and Technologies 65550 and the Trident Cyber9382 and Cyber9385 represent the first 64-bit graphics accelerators here, while the NeoMagic MagicGraph NM2070 pushes the envelope further with a 128-bit design.

Notebooks in this roundup set new record scores on Graphics WinMark 96 with the help of more powerful processors. The ThinkPad 760ED used the Trident Cyber 9385 graphics chip set to power it to a record Graphics WinMark 96 score of 17.1. The Trident Cyber 9382 and Cyber 9385 chip sets each feature a 64-bit

ZD Winstone 96

Bold type denotes first place within each category.	Score
LIGHTWEIGHT	
Digital HiNote Ultra II CTS5120 (Pentium/120)	42
IBM ThinkPad 560 (Pentium/120)	37
PRESENTATION	
ACW ND5123T (Pentium/133)	53
AMS PowerCD 8550 (Pentium/133)	39
ARMNote TS80CD133TX (Pentium/133)	41
AST Ascentia P50 (Pentium/133)	46
BSI NP5265A (Pentium/150)	39
Compaq LTE 5300 (Pentium/133)	47
DFI 7200TC (Pentium/133)	49
DTK DTN-5P120C (Pentium/120)	43
Ergo CD-PowerBrick (Pentium/120)	44
FutureMate 5813T (Pentium/133)	52
Gateway 2000 S5-133 (Pentium/133)	46
Hertz Z-Optima NB P150c (Pentium/150)	47
HP OmniBook 5500 CT (Pentium/133)	49
IBM ThinkPad 760ED (Pentium/133)	57
Micro Express NP8600-P120 (Pentium/120)	43
Micron Millennia TransPort (Pentium/133)	54
NEC Versa 4080H (Pentium/120)	39
Samsung SENS 810 (Pentium/133)	49
Toshiba Tecra 720CDT (Pentium/133)	46
Twinhead Slimnote 8120TV (Pentium/120)	44
WinBook FX (Pentium/133)	48

BETTER ▶

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GUI engine, a 64-bit memory interface that supports EDO DRAM, and an integrated RAMDAC. For video tasks, both also support YUV-to-RGB color-space conversion and bilinear horizontal and vertical interpolated scaling. In addition, the Cyber 9385 supports flicker-free, NTSC/PAL-compliant television output.

The ACW ND5123T and the FutureMate 5133T notebooks (both in the presentation category) each used the Chips and Technologies 65550 chip set and posted Graphics WinMark scores that placed them right behind the ThinkPad 760ED and the high-end value Dell Latitude XPi P133ST. The Chips and Technologies 65550 has a 64-bit graphics engine, 64-bit memory interface, horizontal and vertical interpolation, and an NTSC and PAL video decoder.

Both Dell entries—the Latitude XPi P133ST and the low-end value Latitude XPi P100SD—used the NeoMagic MagicGraph NM2070 graphics chip set. This chip set touts two key features:



The new ZD BatteryMark test gauges battery life under typical usage scenarios.

power conservation and fast graphics performance. In both cases these claims seem to be true. Both Dell notebooks finished first in their respective categories on our Graphics WinMark tests, and the P100SD was also the top performer on our BatteryMark test. The NeoMagic MagicGraph NM2070 is a single-chip solution, which integrates the graphics engine, RAMDAC, and 1MB of DRAM memory. This high level of integration, combined with a 128-bit graphics engine and 128-bit memory path, are what give the chip its top-flight performance.

Hard disk performance in notebooks is slowly catching up to that in desktops. A major hindrance to breakneck performance is spindle speeds. On the desktop, 7,200-rpm Fast/Wide SCSI-2 disks are currently the top performers. For IDE disks in desktop PCs, top performance is gained from 5,400-rpm disks. In the notebook arena, the fastest

Continues

ZD Winstone 32 Score	ZD Graphics WinMark 96 Millions of pixels per second	ZD Disk WinMark 96 Score	ZD CPUmark$_{16}$ Score	ZD CPUmark$_{32}$ Score	ZD BatteryMark Hours:minutes
10.5	662	169	155	3:02
9.2	605	178	172	3:38
14.8	644	237	231	1:28
8.6	594	175	164	N/A
9.8	593	224	220	1:09
11.3	670	247	236	3:30
9.3	560	161	148	0:59
10.9	624	235	220	2:32
11.0	643	228	221	1:24
11.6	589	193	182	1:30
9.9	592	212	210	1:51
15.0	615	238	230	1:33
11.5	647	223	214	2:29
10.2	635	233	224	1:47
13.1	643	233	234	2:26
17.1	843	257	253	2:53
11.4	573	186	180	1:20
12.3	770	247	248	2:41
10.3	622	148	134	2:19
6.7	562	273	279	2:47
12.7	608	251	247	2:42
10.2	572	204	200	1:37
10.9	534	253	244	3:46
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BENCHMARK TESTS

Continued
disks spin at a comparatively slow 4,900-rpm . The IBM DPRA-20810 and 21215, which are 4,900-rpm disks, were used in only six systems. Four of the top six performers on our Disk WinMark tests among low-end value, high-end value, and presentation systems all used these IBM hard disks.

ZD CPUmark$_{16}$ and ZD CPUmark$_{32}$

L2 cache, once rarely seen in notebooks, is now widely used: Only 9 of the 58 portables that we tested for this roundup did not have L2 cache. In addition, 40 of the reviewed systems had the faster pipelined-burst or synchronous L2 cache instead of the slower asynchronous variety. Also, 24 systems made use of EDO DRAM, which provides a performance boost over standard fast-page-mode DRAM. The Pentium/133-based Samsung SENS 810 (a presentation unit) used the mobile Triton chip set, 256K of pipelined-burst L2 cache, and EDO DRAM to come away with the top CPUmark$_{16}$ score of 273 and top CPUmark$_{32}$ score of 279.

This roundup marks the introduction of the Intel mobile Triton (82430MX) chip set, used by 11 machines. The mobile Triton supports EDO DRAM, pipelined-burst L2 cache, and Enhanced-IDE modes 3 and 4. The major difference between Intel's mobile Triton and its Triton chip set for desktop PCs is that the mobile Triton supports Advanced Power Management features including auto-clock throttle, CPU clock control for thermal management, suspend, standby, and PCI power management. Systems using the mobile Triton tended to be our top CPUmark performers.

The Canon Innova Book used the AMD Am5x86-P75 processor. As stated previously, the 5x86 is really a DX4/133 that should give system performance equivalent to that of a Pentium/75-equipped machine. On CPUmark performance, the AMD chip did not quite live up to its name. The Innova Book posted scores that were about 3 percent lower than those of the average Pentium/75 on the CPUmark$_{32}$ test and about 10 percent lower on the CPUmark$_{16}$ test.

ZD BatteryMark

For this issue we introduce our new BatteryMark benchmark test. Employing a constant-usage scenario, the BatteryMark benchmark test evaluates a notebook with its power-management features enabled. The unit being tested runs through work periods and "think" periods where the system is idle. The screen remains active throughout the entire test. We believe that this scenario represents a work pattern typical of someone on a cross-country flight. The numbers reported are representative of how much actual and constant usage you can receive from the system. Actual user results will vary due to different power conservation settings.

The top nine systems on our BatteryMark test all used lithium ion batteries. In fact, 27 out of the 58 systems here used lithium ion batteries—up from 16 out of 41 in our last notebook roundup. While the shortage of lithium ion batteries is easing, they still cost more than nickel hydride battery packs.

The top performer on our BatteryMark test was the Dell Latitude XPi P100SD. With nearly 5 hours of life, it should last for the duration of a cross-country flight, allowing for breaks. Dell attributes its notebook's long battery life to low-powered components including the NeoMagic MagicGraph graphics chip set.

ZD CD-ROM WinMark 96 and Multimedia Tests CD-ROM

Continues

Bold type denotes first place within each category.

	ZD Winstone 96 Score
LOW-END VALUE	
AMS SoundPro P54 (Pentium/100)	39
BSI NP8657D (Pentium/75)	33
Canon Innova Book 360CD (AMD 5x86-P75)	34
ChemBook 5400 Dual (Pentium/75)	26
Dell Latitude XPi P100SD (Pentium/100)	47
Digital HiNote VP CSS5100 (Pentium/100)*	35
HP OmniBook 5500 CS (Pentium/100)	43
Micro Express NP8000-P120 (Pentium/120)	43
Olivetti Echos P100D (Pentium/100)	34
Samsung SENS 810 (Pentium/100)	42
TI Extensa 515 (Pentium/100)	34
Twinhead Slimnote 875CX (Pentium/75)	31
WinBook XP5 P100 (Pentium/100)	45
HIGH-END VALUE	
Acer Note Light (Pentium/100)	39
AMS PowerCD 8500 (Pentium/120)	40
ARMNote TS30CP90T (Pentium/90)	42
AST Ascentia J50 (Pentium/133)	56
Austin Edge CD (Pentium/133)	48
BSI NP8662T (Pentium/120)	43
ChemBook 5400 TFT (Pentium/150)	39
Dell Latitude XPi P133ST (Pentium/133)	53
Digital HiNote VP CTS5100 (Pentium/100)*	42
Gateway Solo S5-120 (Pentium/120)	44
IBM ThinkPad 365XD (Pentium/120)	42
Keydata Keynote GT (Pentium/120)	43
Maximus MediaNote CD Book (Pentium/133)	39
MaxTech YesBook Model X753 (Pentium/120)	44
NEC Versa 4000C (Pentium/75)	34
Olivetti Echos P133S (Pentium/133)	46
Polywell Poly 500NB5 (Pentium/133)	36
TI Extensa 570CDT (Pentium/100)	42
Toshiba Satellite Pro 420CDT (Pentium/100)	44
Twinhead Slimnote 8100TX (Pentium/100)	43
Unisys Aquanta MN (Pentium/120)	38
WinBook XP5 P120 (Pentium/120)	44

BETTER ▶

*We tested this notebook several times, and we report the highest score achieved in each instance.

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Winstone 32	ZD Graphics WinMark 96 Millions of pixels per second	ZD Disk WinMark 96 Score	ZD CPUmark$_{16}$ Score	ZD CPUmark$_{32}$ Score	ZD BatteryMark Hours:minutes
	8.8	561	145	141	2:48
	7.0	524	133	124	1:22
	8.6	522	115	115	2:01
	5.2	394	109	99	1:05
	13.1	675	181	181	4:52
	7.4	688	171	170	1:42
	10.3	511	198	204	2:49
	9.8	569	179	172	1:12
	7.3	514	130	128	1:21
	6.8	725	220	224	1:27
	7.0	459	151	149	2:49
	5.5	514	143	143	1:47
	10.5	599	175	170	3:52
	8.9	616	153	148	2:59
	9.0	596	180	169	1:39
	10.9	526	161	160	1:18
	13.7	750	255	258	2:21
	10.7	559	246	243	3:57
	11.5	582	172	163	1:30
	9.2	559	156	140	0:46
	15.9	765	229	213	3:09
	9.5	670	172	170	1:29
	10.9	605	193	186	2:52
	10.6	645	175	171	2:20
	11.0	452	178	173	1:59
	10.0	566	146	135	2:00
	9.5	612	216	210	1:45
	8.8	504	122	111	2:07
	11.9	583	196	188	1:11
	9.0	446	105	96	1:01
	10.3	641	177	162	2:09
	10.9	614	177	180	3:28
	9.9	576	194	194	1:49
	8.9	599	144	133	1:00
	11.4	608	184	178	2:50
BETTER▶	BETTER▶	BETTER▶	BETTER▶	BETTER▶	BETTER▶

each instance.

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BENCHMARK TESTS

▲ Higher scores represent better performance. ▼ Lower scores represent better performance. Bold type denotes first place within each category.	ZD CD-ROM WinMark 96 Score ▲	CD-ROM Sequential 16K Read KBps ▲	CD-ROM Access Time ms ▼	CD-ROM CPU Utilization ▼	HIGH-QUALITY ACTION INDEO[1] Frames Dropped ▼	HIGH-QUALITY ACTION INDEO[1] CPU Utilization ▼	FULL-SCREEN SCALING[2] Frames Dropped ▼	FULL-SCREEN SCALING[2] CPU Utilization ▼	MEDIUM-QUALITY ACTION CINEPAK[3] Frames Dropped ▼	MEDIUM-QUALITY ACTION CINEPAK[3] CPU Utilization ▼
PRESENTATION										
ACW ND5123T (Pentium/133)	425	611	254	52%	0	80%	0	73%	0	56%
AMS PowerCD 8550 (Pentium/133)	393	613	232	45%	298	99%	329	99%	0	77%
ARMNote TS80CD133TX (Pentium/133)	384	601	235	45%	186	99%	327	99%	0	77%
AST Ascentia P50 (Pentium/133)	359	612	272	31%	12	84%	317	99%	0	62%
BSI NP5265A (Pentium/150)	422	612	280	40%	80	99%	406	96%	0	71%
Compaq LTE 5300 (Pentium/133)	409	613	303	30%	0	88%	336	99%	0	61%
DFI 7200TC (Pentium/133)	390	601	229	32%	0	95%	303	99%	0	68%
DTK DTN-5P120C (Pentium/120)	404	612	199	41%	0	94%	306	99%	0	56%
Ergo CD-PowerBrick (Pentium/120)	410	613	271	32%	6	99%	400	99%	0	66%
FutureMate 5813T (Pentium/133)	435	612	264	51%	0	90%	0	79%	0	60%
Gateway Solo S5-133 (Pentium/133)	389	601	241	33%	0	96%	396	100%	0	72%
Hertz Z-Optima NB P150c (Pentium/150)	412	614	267	33%	6	99%	403	96%	0	68%
HP OmniBook 5500 CT (Pentium/133)	459	614	207	44%	0	88%	228	99%	0	57%
IBM ThinkPad 760ED (Pentium/133)	422	613	263	32%	0	63%	88	100%	0	45%
Micro Express NP8600-P120 (Pentium/120)	457	615	195	42%	0	96%	310	99%	0	58%
Micron Millennia TransPort (Pentium/133)	498	916	224	53%	0	76%	433	99%	0	59%
NEC Versa 4080H (Pentium/120)	363	612	277	40%	194	99%	290	99%	0	66%
Samsung SENS 810 (Pentium/133)	471	612	196	23%	0	93%	405	99%	0	69%
Toshiba Tecra 720CDT (Pentium/133)	598	906	185	66%	0	92%	419	99%	0	67%
Twinhead Slimnote 8120TV (Pentium/120)	385	604	232	47%	206	99%	343	99%	0	76%
WinBook FX (Pentium/133)	417	612	256	32%	0	79%	321	99%	0	56%

(1) With an Action, Indeo, 320 x 240, 30-fps, 600-KBps clip.
(2) With an Action, Indeo, 160 x 120, 30-fps, 300-KBps clip scaled to full screen (1,024 x 768).
(3) With an Action, Cinepak, 320 x 240, 30-fps, 300-KBps clip.

Continued
drives have become a fundamental part of notebooks. Whether as an option or an integrated component, 46 out of the 58 systems had CD-ROM drives. Five of the systems came with 6X drives, while only one came with the slower 2X drive. Most systems handled our multimedia video clips without much trouble. The Full-Screen Scaling test, however, which uses an Action Indeo clip, was where most systems had trouble. Standout performers on this test were two of the IBM systems tested, both of which used Trident graphics chips. The ThinkPad 760ED used the Trident Cyber9385 chip, and the ThinkPad 365XD used the Trident Cyber9320 chip. These chips have video scaling built in to boost performance.—*Analysis by Richard Fisco*

How We Tested

We tested all notebooks with 16MB of RAM and 700MB hard disks or larger. We used each vendor's preinstalled graphics driver for either 800-by-600 or 640-by-480 resolution (depending on what the display could handle) with 256 colors and small fonts. We also disabled power-management features and removed unnecessary drivers. We defragmented hard disks before each test and let Windows 95 manage virtual memory settings.

We used our **ZD Winstone 96, Version 1.0,** benchmark test suite to measure the machines' performance when running typical Windows applications. Winstone 96 measures the time a PC takes to execute a set of application scripts that exercise 13 of the best-selling Windows applications. Winstone weights a given PC's test timings based on the applications' market share; it derives a composite number and converts it to a relative score. (The score is relative to the performance of a 486SX/25 Dell 425s/P with 8MB of RAM, whose score is defined as 10.)

We also used our benchmark test suite **ZD Winstone 32, Version 1.0,** to measure units' performance when running 32-bit Windows applications. Winstone 32 measures the time a PC takes to execute a set of scripts that utilize eight best-selling 32-bit applications. Like Winstone 96, Winstone 32 then weights a given PC's test timings based on the market share of the applications and converts it to a relative score. Both Winstone tests use the same reference machine—the Dell 425s/P—whose score is defined as 10. The Winstone 32 reference system, however, runs Windows 95 and MS-DOS 7.0, while the Winstone 96 reference system runs Windows 3.1 and MS-DOS 6.2.

We used our benchmark test suite, **ZD WinBench 96, Version 1.0,** as a measure of graphics, disk, processor, CD-ROM, and motion-video performance under Windows. The **ZD Graphics WinMark 96** score, a number based on 115 tests of Windows GDI functions, represents the performance of each machine's graphics subsystem under Windows. The **ZD Disk WinMark 96** score, based on extensive application profiling,

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▲Higher scores represent better performance. ▼Lower scores represent better performance. Bold type denotes first place within each category.	ZD CD-ROM WinMark 96 Score ▲	CD-ROM Sequential 16K Read KBps ▲	CD-ROM Access Time ms ▼	CD-ROM CPU Utilization ▼	HIGH-QUALITY ACTION INDEO[1] Frames Dropped ▼	HIGH-QUALITY ACTION INDEO[1] CPU Utilization ▼	FULL-SCREEN SCALING[2] Frames Dropped ▼	FULL-SCREEN SCALING[2] CPU Utilization ▼	MEDIUM-QUALITY ACTION CINEPAK[3] Frames Dropped ▼	MEDIUM-QUALITY ACTION CINEPAK[3] CPU Utilization ▼
LOW-END VALUE										
BSI NP8657D (Pentium/75)	446	613	**198**	46%	252	99%	403	97%	0	69%
Canon Innova Book 360CD (AMD 5x86-P75)	416	**615**	273	37%	0	95%	**175**	99%	0	67%
ChemBook 5400 Dual (Pentium/75)	406	612	273	46%	224	99%	447	99%	0	84%
HP OmniBook 5500 CS (Pentium/100)	459	**615**	210	45%	0	89%	263	99%	0	56%
Micro Express NP8000-P120 (Pentium/120)	397	613	283	38%	58	99%	320	99%	0	68%
Samsung SENS 810 (Pentium/100)	**462**	611	199	**23%**	0	**79%**	367	100%	0	58%
Twinhead Slimnote 875CX (Pentium/75)	367	599	236	55%	218	99%	436	99%	0	85%
HIGH-END VALUE										
AMS PowerCD 8500 (Pentium/120)	244	307	283	30%	⊗	98%	333	99%	0	83%
Austin Edge CD (Pentium/133)	418	614	268	32%	0	**79%**	321	99%	0	56%
BSI NP8662T (Pentium/120)	458	613	204	42%	3	97%	315	99%	0	59%
ChemBook 5400 TFT (Pentium/150)	418	612	273	41%	79	99%	405	100%	0	71%
Gateway Solo S5-120 (Pentium/120)	381	599	241	37%	5	99%	399	99%	0	75%
IBM ThinkPad 365XD Pentium/120)	400	614	289	35%	0	83%	**0**	**74%**	0	58%
Keydata Keynote GT (Pentium/120)	405	614	278	**20%**	0	82%	58	99%	0	53%
Maximus MediaNote CD Book (Pentium/133)	443	611	205	37%	0	93%	23	99%	0	60%
MaxTech YesBook Model X753 (Pentium/120)	404	613	285	32%	14	99%	404	99%	0	67%
NEC Versa 4000C (Pentium/75)	358	614	294	41%	221	99%	120	99%	0	63%
Olivetti Echos P133S (Pentium/133)	412	614	268	33%	0	86%	264	99%	0	60%
Polywell Poly 500NB5 (Pentium/133)	421	612	253	**20%**	0	95%	389	99%	0	**44%**
TI Extensa 570CDT (Pentium/100)	386	600	232	35%	3	98%	340	99%	0	67%
Toshiba Satellite Pro 420CDT (Pentium/100)	**583**	**913**	**180**	46%	0	89%	71	99%	0	53%
Twinhead Slimnote 8100TX (Pentium/100)	384	600	231	45%	0	82%	239	100%	0	63%
Unisys Aquanta MN (Pentium/120)	389	612	267	50%	209	99%	395	99%	0	76%

(1) With an Action, Indeo, 320 x 240, 30-fps, 600-KBps clip.
(2) With an Action, Indeo, 160 x 120, 30-fps, 300-KBps clip scaled to full screen (1,024 x 768).
(3) With an Action, Cinepak, 320 x 240, 30-fps, 300-KBps clip.
⊗ This unit's performance was too poor to measure.

epresents the disk subsystem's performance under Windows. The **CPUmark$_{16}$** and **CPUmark$_{32}$** scores gauge the speed of a PC's processor ubsystem—which includes the CPU, secondary cache, and system AM—under 16- and 32-bit operating systems, respectively.

The **ZD CD-ROM WinMark 96** tests gauge the performance of the otebooks' CD-ROM subsystem, which includes the CD-ROM ive and its required software drivers. This test suite is based on a rofile of six of today's most popular Windows CD-ROMs.

We report the results of the **CD-ROM Sequential 16K Read** test, hich measures the throughput of the CD-ROM subsystem as it eads 16K blocks of data on a CD-ROM. The **Access Time** score easures the CD-ROM drive's performance while randomly ccessing 2K blocks from the entire CD-ROM.

The **CD-ROM CPU Utilization** score represents the percentage of the rocessor's bandwidth occupied by servicing the CD-ROM subsys- em while it retrieves data. To determine the utilization, WinBench 96 es a default block size of 16K. The transfer rate defaults to the maxi- um rate of your particular CD-ROM subsystem. WinBench 96 then alculates this transfer rate before it runs the actual test. WinBench 96 also includes the Video test, a suite of 33 video clips that measure the PC's ability to play full-motion AVI files. The Video test allows you to test video-playback performance with two types of clips at a variety of data and frame rates, using either the Indeo or Cinepak codec.

We report results from the **High-Quality Action Indeo** test, which uses an Action Indeo, 320-by-240, 30-frame-per-second, 600-KBps video clip; the **Full-Screen Scaling** test, which uses the Action Indeo, 160-by-120, 30-fps, 300-KBps clip; and the **Medium-Quality Action Cinepak** test, which uses an Action Cinepak 320-by-240, 30-fps, 300-KBps clip.

Our **ZD BatteryMark** test measures a notebook's battery life by exercising three different 32-bit software workload engines, one each for processor, disk, and graphics tasks. BatteryMark mixes these workloads together and adds periodic "think times," or breaks, in the work that reflect the way users pause while working. We use standard power-management settings during testing: 30 seconds for display timeout, 2 minutes for hard disk timeout (or the closest value available), and Auto or Fast CPU speed. BatteryMark also uses Microsoft Advanced Power Management where possible to automate procedures and provide information.

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down, giving the unit below-average scores on both sets of Winstone tests, both sets of CPUmark tests, and the Graphics and Disk WinMark 96 tests. The CD-ROM WinMark 96 test score was average, thanks to a TEAC 4X CD-ROM drive.

The 5400 Dual includes a 773MB hard disk, a Cirrus Logic graphics chip set with 2MB VRAM, and an 11.4-inch SVGA dual-scan display. The nickel hydride battery sustained the unit for only 1:05 on our BatteryMark test.

The ChemBook 5400 TFT has a 150-MHz Pentium CPU and a 12.1-inch SVGA active-matrix screen. The 1.3GB hard disk and DRAM don't do much for the 5400 TFT's performance scores, which were more in line with those of a 100-MHz system. Because the CPUmark$_{16}$ and CPUmark$_{32}$ test scores were below average, they held down the Winstone 32 and Winstone 96 numbers to below-average levels. The notebook had below-average Graphics WinMark 96 and average Disk and CD-ROM WinMark 96 scores. The nickel hydride battery lasted 46 minutes on our BatteryMark test, the shortest time of any system in this roundup. *—BB*

ChemBook 5400 Dual. Street price: $3,075.
ChemBook 5400 TFT. Street price: $4,000. Chem USA Corp., Hayward, CA. *(No Indian partner.)*

Compaq Computer Corp.

Compaq LTE 5300

If you're looking for a top-quality multimedia presentation portable, the Compaq LTE 5300, from Compaq Computer Corp., is a stalwart choice. The Pentium/133-based LTE 5300, with a 12.1-inch active-matrix SVGA display, a Toshiba 1.3GB hard disk, and a 4X TEAC CD-ROM drive, is not inexpensive at a street price of $6,647. But solid performance and a three-year warranty make this unit a good bet for corporate buyers.

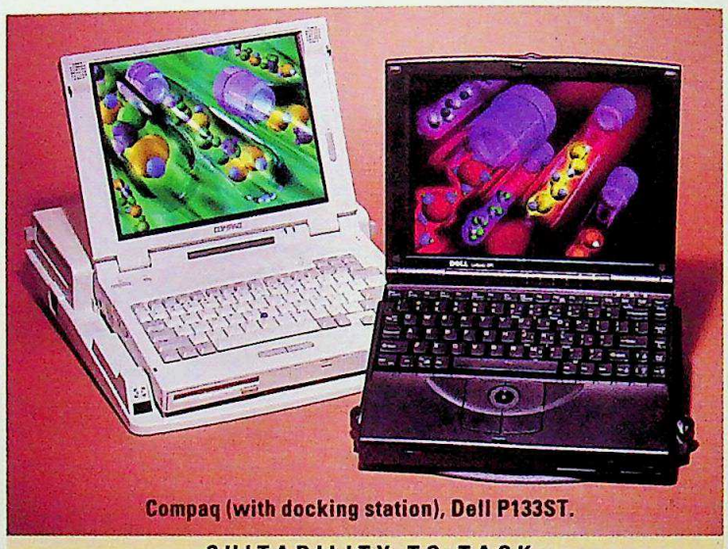
Compaq's notebook has a travel weight of 8.3 pounds. Its modular design lets you interchange the CD-ROM drive with a floppy disk drive, an additional hard disk (for a potential on-board total capacity of 2.7GB), or a second battery. Without the CD-ROM drive, the base system is $5,999. The LTE 5300's $499 Multi-Bay Expansion Base docking station has room for two drive bays, each of which can accept a 3.5-inch floppy disk drive, a hard disk, or a CD-ROM drive; it also has a monitor stand and a full complement of peripheral ports.

Compaq uses its own motherboard with 256K pipelined-burst cache and conventional DRAM system memory in the LTE 5300, which holds its own in the presentation field. All its benchmark test scores were within the average range. The video subsystem has only 1MB memory, but its speedy EDO DRAM helps to keep its graphics performance average. Even the LTE 5300's battery life was very good—though not tops—scoring 2:32 on the BatteryMark test with a nickel hydride battery. *—BB*

Compaq LTE 5300. Street price: $6,647. Compaq Computer Corp., Houston, TX; http://www.compaq.com. *(Indian subsidiary Compaq India, Bangalore; partners BPL, Bombay; CMC, New Delhi; CG Infomatics, Fujitsu-ICIM, Bombay; Microland, Bangalore; Minicom, Redington, Tangerine, Bombay; Thakral Computers, New Delhi.)*

SERVICE & RELIABILITY
Compaq Computer Corp.

Reliability	Better than average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Better than average



Compaq (with docking station), Dell P133ST.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Compaq LTE 5300	Good	Good
Dell Latitude XPi P133ST	Fair	Good
Dell Latitude XPi P100SD	Fair	Good

Dell Computer Corp.

Latitude XPi P100SD, Latitude XPi P133ST

If you are looking for a solid road-warrior notebook, the Latitude series from Dell Computer Corp. represent excellent choices. The Pentium/133-based high-end value Latitude XPi P133ST is priced at $4,859 (direct), and the Pentium/100-based low-end value Latitude XPi P100SD, an honorable mention in this roundup, is $3,459 (also direct).

The Latitude XPi P100SD left the competition in the dust on the BatteryMark test, lasting 4:52, thanks to the lithium ion battery and some clever engineering. The Latitude XPi P133ST lasted a competitive 3:09. Both Latitudes posted above-average results on our other tests, with the exception of average scores for the P100SD on the CPUmark tests.

Each system comes equipped with an embedded trackball, two Type II PC Card slots, 16-bit audio, and an infrared port. The XPi P133ST has an 11.3-inch SVGA active-matrix display and a 1.2GB hard disk; the XPi P100SD has a 10.3-inch SVGA dual-scan display and 773MB of storage. For an additional $229, you can buy an optional DeskDock with Advanced Port Replicator, which adds SCSI-2 and 10Base-T Ethernet to the system. At a travel weight of 6.9 pounds, the Latitudes are lighter than most notebooks in this roundup.

The most impressive feature of these notebooks is their power management. According to Dell, a combination of low-power components is responsible for a 20 to 30 percent reduction in power consumption. These components include mobile Pentium CPUs with Voltage Reduction Technology, power-saving graphics chip technology, and in the case of the XPi P133ST, an efficient active-matrix

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The Shape of Notebooks to Come

By Anush Yegyazarian

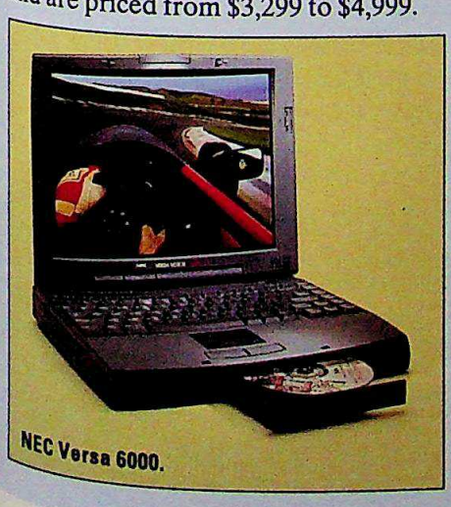
The current crop of notebooks is impressive, but some of their equally innovative brethren could not make our review deadline. To bridge that gap, here are specs on some of the newly available or soon-to-be available notebooks from Compaq, Fujitsu, Hitachi, NEC, Sharp, and Toshiba.

NEW FACES

The strong growth projected for the portables market has lured in two new vendors: Fujitsu and Hitachi. The Milan, Monte Carlo, and Montego notebook series mark Fujitsu's entry, while Hitachi makes its bow with its M series and its C series of lightweights.

Notebooks in the three Fujitsu lines all offer infrared ports, 16-bit sound, and lithium ion batteries. The mainstream workhorse is the Milan, offering an 11.3-inch active-matrix display and a weight of just under 6 pounds. The units, priced from $2,199 to $3,999, also feature bridge-battery technology that allows warm-swapping of batteries.

Notebooks in the Fujitsu Monte Carlo series are multimedia desktop replacements and come with 11.3- or 12.1-inch SVGA TFT displays, a 6X CD-ROM drive, MPEG1 support, and a removable floppy disk drive that can be replaced with a second battery. These systems weigh about 7.3 pounds and are priced from $3,299 to $4,999.



NEC Versa 6000.

Both lines offer 100- to 133-MHz CPUs and 810MB or 1.2GB hard disks.

Hitachi's M series targets users looking for full-featured multimedia-ready notebooks. The systems come with a 4X CD-ROM drive (6X on 133-MHz models), an integrated 28.8-Kbps modem, 10Base-T Ethernet and IR ports, and 16-bit sound with two speakers—not bad for a 7-pound package. The 11.8-inch SVGA TFT screen is ultra-flexible: You can slide it back or bring it forward at its base to improve viewing angles. The units have 1GB of storage, 16MB of RAM, nickel hydride batteries and go up to a 133-MHz CPU. Prices range from $2,499 to $5,499.

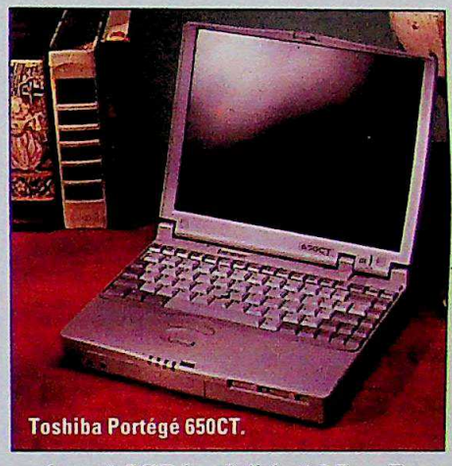
FAMILIAR PLAYERS

Compaq is represented in our roundup by its LTE 5300, a full-featured unit. But aside from that and its lightweight Armada 4100, it also markets the value-oriented Armada 1120 series, which replaces Compaq's Contura 400 line. Standard components include a 10.4-inch VGA display (dual-scan or active-matrix), an 810MB hard disk, and a nickel hydride battery. Units weigh about 6 pounds, and pricing starts at $1,899.

NEC's Versa 4000 series was covered in our main review, but the new Versa 6000s missed our deadline. The new multimedia units come with 133- or 100-MHz CPUs, 256K L2 cache, 16MB RAM standard, 11.3- or 12.1-inch active-matrix SVGA displays, a 6X CD-ROM drive, an internal cellular-ready 28.8-Kbps voice modem, 1GB+ hard disks, a lithium ion battery, 64-bit graphics, front and back 4-Mbps Fast IR ports, and 32-bit PC CardBus support.

The Versa 6000 also boasts integrated MPEG hardware. Its VersaBay II modular slot can fit a floppy disk drive, CD-ROM drive, second battery, or a second hard disk. These systems weigh about 7 pounds. One model, the 6030X, will have a 12.1-inch display capable of 1,024-by-768 resolution (XVGA). Prices range from about $5,399 to $6,499.

Sharp's new system is the 7-pound PC-9080. This multimedia notebook includes a Pentium/133, 256K of L2



Toshiba Portégé 650CT.

cache, a 1.3GB hard disk, 4-Mbps Fast IR, a removable 6X CD-ROM drive, and 16-bit stereo sound. Its most obvious feature is its brilliant 12.1-inch XVGA screen, which uses Sharp's new Super High Aperture technology to reduce power consumption and increase screen brightness. The unit also has 64-bit PCI architecture and a removable floppy disk drive that can be replaced by a second lithium ion battery. Units are expected to cost under $6,000.

Toshiba's newest Portégé, the Pentium/133-based 650CT, was also not available in time to meet our deadline. This lightweight notebook has all the features of most mainstream portables but ups the ante with ZPV MPEG technology and 32-bit CardBus support, plus a 11.3-inch SVGA TFT display, 1.2GB hard disk, 64-bit graphics, and full duplex 16-bit sound, all in a sub-5-pound package. (The floppy disk drive is external.) The unit also has 2MB of VRAM for its graphics subsystem, and an integrated 28.8-Kbps modem. Units with 16MB of EDO DRAM and 256K of pipelined-burst cache are $4,999.

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display. An improved power management algorithm reduces the power load and allows user configuration through a utility in Windows 95. Other impressive components include a 128-bit graphics accelerator with a 64-bit BitBLT engine from NeoMagic and 256K of synchronous L2 cache. —*CL*

SERVICE & RELIABILITY	
Dell Computer Corp.	
Reliability	Better than average
Repair	Average
Technical support	Average
Percent needing repair	Average

Latitude XPi P100SD. Direct price: $3,459.
Latitude XPi P133ST. Direct price: $4,859.
Dell Computer Corp., Austin, TX; http://www.dell.com.
(Indian partners Cals, PCL, New Delhi, ESPL, Chandigarh; Rolta India, Bombay.)

Diamond Flower Instrument

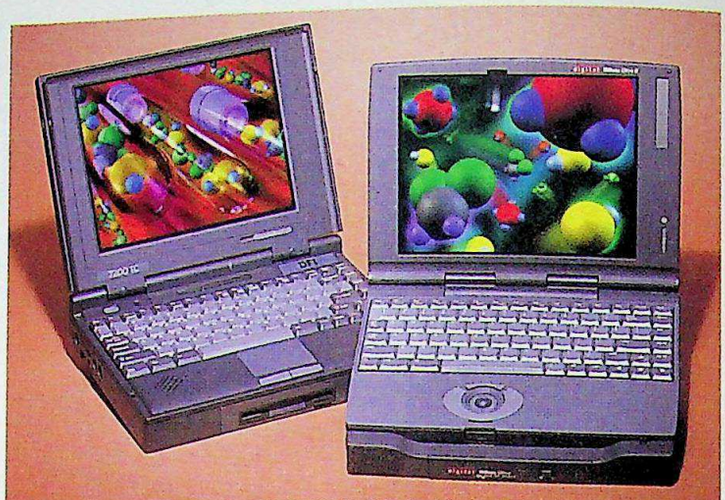
DFI 7200TC

With a laudable array of modular multimedia features and average performance, Diamond Flower Instrument's $4,199 Pentium/133-based DFI 7200TC fulfills the needs of its target market—users who need a versatile mobile presentation solution. DFI, originally a graphics card manufacturer, now sells DFI-brand desktops and notebooks and provides components to other PC vendors.

The unit has a travel weight of 8.1 pounds and features a 10.4-inch active-matrix SVGA display. Graphics are handled by a 32-bit Cirrus Logic CL-GD7543 chip set and 1MB of DRAM. The unit offers an integrated 16-bit FM synthesis audio system, a game/MIDI port, an NTSC- and PAL-compatible video-out port, a docking station port, and an IrDA-compliant infrared transceiver.

The 7200TC was an average performer across all our tests within its category. The lithium ion battery was one of the lightest we encountered (about 12 ounces), but it lasted just 1:24 on our BatteryMark test.

The 7200TC's front-mounted 4X CD-ROM drive module can be swapped for a floppy disk drive module or for a second battery. The floppy disk drive can be used externally via a special cable.



DFI, Digital CTS5120 (with docking station).

SUITABILITY TO TASK

	Desktop replacement	Road warrior
DFI 7200TC	Good	Good
Digital HiNote Ultra II CTS5120	Fair	Good
Digital HiNote CP CSS5100	Fair	Fair
Digital HiNote VP CTS5100	Fair	Fair

The 7200TC's case design is similar to that of four other units in this roundup: Twinhead's Slimnote 875CX, 8100TX, and 8120TV and ARM's ARMNote TS80CD133TX.—*RSA*
DFI 7200TC. Street price: $4,199. Diamond Flower Instrument, Fremont, CA.
(No Indian partner.)

Digital Equipment Corp.

HiNote VP CSS5100, HiNote VP CTS5100, HiNote Ultra II CTS5120

Digital Equipment Corp.'s three entries span the lightweight and both value classes. The HiNote Ultra II CTS5120 ($4,799 street) is the thinnest and lightest notebook here at only 4.7 pounds (travel weight). The 120-MHz unit was an average performer, with a strong Disk WinMark 96 score and an excellent BatteryMark score of 3:02. The 100-MHz high-end value HiNote VP CTS5100 and the 100-MHz low-end value HiNote VP CSS5100 have 6.7-pound travel weights and cost $2,999 and $2,499, respectively.

Designed for power users looking for the ultimate in portability, the Ultra II features an external floppy disk drive that snaps to the bottom of the system (a version of this drive with additional PC Card slots is $299) and a lithium ion battery that attaches to the rear of the notebook and folds down to angle the unit for easier typing. An optional Mobile Media Module ($699) adds a 4X CD-ROM drive (6X will be standard when you read this), better stereo speakers, and 1.9 pounds. The unit also offers a 10.4-inch active-matrix SVGA display, two Type II PC Card slots, and a trackball.

Geared for business users on a budget, the CTS5100 and the CSS5100 share many features, including a touch pad, built-in 16-bit audio with speakers, two Type II PC Card slots, and an infrared port. The removable floppy disk drive can be replaced with a second battery, an AC adapter, or a $99 car adapter. Both displays are 10.4 inches, but the CTS5100 has an active-matrix screen, and the CSS5100 uses a dual-scan panel.

The CTS5100 and CSS5100 were unable to produce consistent scores on our tests. The test scores that we report are the highest scores produced during multiple test runs; all fall into the average range for each unit's category. We believe these variances—ranging from 17 to 350 percent, depending on the test—are caused by Digital's Active Thermal Feedback feature, which clocks back the CPU when excessive system heat is detected (see "What the Numbers Mean" for more details).—*CL*
HiNote VP CSS5100. Street price: $2,499.
HiNote VP CTS5100. Street price: $2,999.
HiNote Ultra II CTS5120. Street price: $4,799. Digital Equipment Corp., Maynard, MA; http://www.pc.digital.com.
(Indian subsidiary DEIL, Bangalore; partners ADML, Bangalore; CMS, Godrej Pacific, Bombay; IT & T, New Delhi.)

SERVICE & RELIABILITY	
Digital Equipment Corp.	
Reliability	Average
Repair	Average
Technical support	Average
Percent needing repair	Average

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DTK Computing Inc.

DTK DTN-5P120C

The $3,600 DTK DTN-5P120C, from DTK Computing, has a lot to offer those in search of a desktop replacement. This 120-MHz unit offers top-level graphics performance and plenty of hard disk capacity for the high-end business presentation user.

On our benchmark tests, the DTN-5P120C was mainly average compared to other presentation notebooks, with the exception of a below-average Winstone 32 score. The DTN-5P120C uses a Duracell nickel hydride smart battery, but it lasted just 1:30 on our BatteryMark test.

The unit offers a 10.4-inch active-matrix SVGA display, a 1.3GB hard disk, and a built-in 4X CD-ROM drive. In addition to standard I/O ports, the DTN-5P120C has an IrDA infrared port, a game/MIDI port, and a docking station connector. Graphics are handled with 1MB of DRAM and a Chips and Technologies 65548 graphics chip set; audio is based on a 16-bit FM synthesis audio subsystem. A 28.8/28.8-Kbps PC Card fax modem is included.

Not surprisingly, the unit's wealth of multimedia features comes at the cost of heat and heft. A small fan keeps the inside cool; 9 pounds of travel weight makes it one of the heaviest reviewed.

This notebook is essentially the same as the Broadax Systems BSI NP8662T and the Micro Express NP8600-P120, also reviewed in this roundup. —*RSA*

DTN-5P120C. Street price: $3,600. DTK Computer Inc., City of Industry, CA; http://www.dtk.com.

(No Indian partner.)

Ergo Computing Inc.

CD-PowerBrick

Ergo Computing positions its $4,195, Pentium/120-based CD-PowerBrick presentation notebook as an all-in-one solution for multimedia software users. The system offers an 11.3-inch active-matrix SVGA display, a 4X CD-ROM drive, a Sound Blaster Pro–compatible 16-bit audio subsystem, and a removable 776MB Toshiba hard disk. The CD-PowerBrick is essentially the same machine as Hertz's Z-Optima NB P150C and Maxtech Corp.'s YesBook Model X753, also in this roundup.

The CD-PowerBrick posted average results on the CD-ROM WinMark 96 tests and a below-average Graphics WinMark 96 score, despite a Cirrus Logic CL-GD7543 graphics chip set and 2MB of DRAM. Other test scores were average. The unit's nickel hydride battery lasted 1:51 on our BatteryMark test.

The CD-PowerBrick includes an NTSC- and PAL-compatible video-out port, a game/MIDI port, an IrDA-compliant infrared port, and a docking station connector. With a travel weight of 8.7 pounds and a thickness of 2.3 inches, the system is neither light nor slim. However, the unit can accommodate one Type II or one Type III PC Card. A 28.8/14.4-Kbps PC Card fax modem is standard. A Windows 95 tutorial CD augments two Windows 95–specific keys.—*RSA*

CD-PowerBrick. Street price: $4,195. Ergo Computing Inc., Peabody, MA; http://ergocomputing.com.

(No Indian partner.)



DTK, Ergo, FutureTech.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
DTK DTN-5P120C	Good	Fair
Ergo CD-PowerBrick	Good	Good
FutureTech FutureMate 5813T	Good	Good

FutureTech Systems Inc.

FutureMate 5813T

The modular components and strong graphics performance of FutureTech Systems' $3,329, 133-MHz FutureMate 5813T make it a good choice for mobile presentations. The unit, with its 12.1-inch active-matrix SVGA display, is meant as a power machine for heavy multimedia software users. The 5813T is similar to All Computer Warehouse's ACW ND5123T, reviewed elsewhere in this roundup.

The 5813T has two modular bays. One houses either a floppy disk drive or a nickel hydride battery, the other—with the aid of a plastic adapter—a 4X CD-ROM drive module (a 6X drive is available for an additional $100) or another battery.

The 5813T offers a game/MIDI port, an infrared port, an expansion connection, and separate mouse and external keyboard ports. A palm rest is home to a touch pad and two speakers, and the full-size keyboard has two Windows 95–specific keys. The system also comes with 16-bit audio, a 776MB hard disk, and a cellular-capable 28.8/14.4-Kbps PC Card fax modem.

Using Chips and Technologies' 65550 graphics chip set with 1MB of VRAM (2MB of EDO DRAM are now standard), the unit posted a Graphics WinMark 96 score that was one of this roundup's best. Its Winstone 96 score was also above average; other scores were average. The unit, which has an 8.4-pound travel weight, lasted 1:33 on our BatteryMark test. —*RSA*

FutureMate 5813T. Street price: $3,329. FutureTech Systems Inc., Hackensack, NJ; futuretk@styx.ios.com.

(No Indian partner.)

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Gateway 2000 Inc.

Solo S5-120, Solo S5-133

Gateway 2000's $4,499 presentation-class Solo S5-133 and $4,128 high-end value Solo S5-120 (both direct prices) are intended to be complete, multimedia-ready, lightweight notebooks for computing travelers. With travel weights of less than 7.5 pounds, a high degree of modularity, and competitive performance, the Solos succeed.

If you wish to purchase an S5-133 or S5-120 as reviewed here, make sure to list its components; the default configurations are those of the Solo S5-133XL Best Buy and the Solo S5-120XL Best Buy, which are different.

SERVICE & RELIABILITY

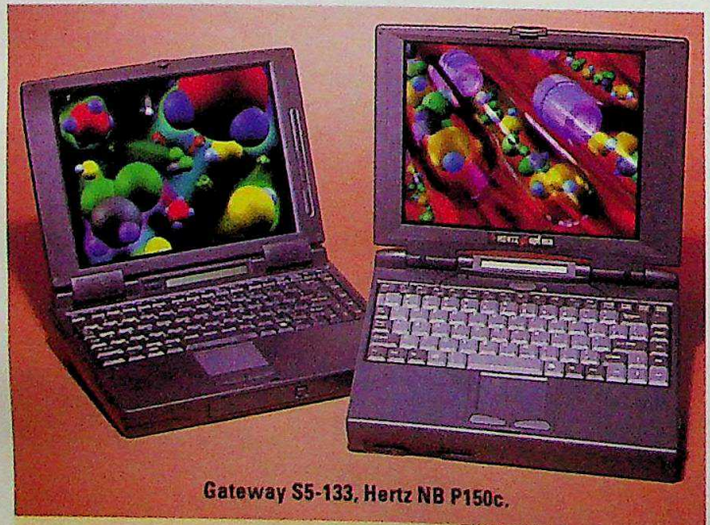
Gateway 2000 Inc.	
Reliability	Average
Repair	Average
Technical support	Better than average
Percent needing repair	Average

Both Solos have the same internal components, including the OPTi Viper chip set on the motherboard, 256K of pipelined-burst processor cache, and Chips and Technologies' 65548 graphics chip set. Each unit also features a lithium ion battery, a 16-bit audio subsystem, a 28.8-Kbps PC Card modem, and a 6X Matsushita CD-ROM drive, which can be replaced by a floppy disk drive. The Solos also have an 115.2-Kbps infrared interface; an IR desktop module is available for $79. Both also include Microsoft Office Professional for Windows 95.

The 133-MHz S5-133 features an IBM 686MB hard disk, an 11.3-inch active-matrix SVGA screen and two speakers, which are located on the hinges of the display panel. The unit earned average scores for its class on all of our benchmark tests and a timing of 2:29 on our BatteryMark test.

The S5-120 had a Toshiba hard disk nearly twice the size of its sibling (1.2GB), but a smaller 10.4-inch active-matrix screen. Its performance was good: Results across all of our benchmark tests were average. It lasted 2:52 on our Battery Mark test.—*Frank J. Evans*

Solo S5-133. Direct price: $4,499. **Solo S5-120.** Direct price: $4,128. Gateway 2000, North Sioux City, SD; http://www.gw2k.com. *(Indian partner DCM-DS, Vikrant Tower, 4 Rajendra Place, New Delhi 110 008. Tel 5719967/76; Fax: 5755731.)*



Gateway S5-133, Hertz NB P150c.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Gateway Solo S5-120	Good	Good
Gateway Solo S5-133	Good	Good
Hertz Z-Optima NB P150c	Good	Good

Hertz Computer Corp.

Z-Optima NB P150c

The Z-Optima NB P150c ($3,995 direct), from Hertz Computer Corp., is one of three 150-MHz notebooks in a field of mostly 100- to 133-MHz units. Its high level of processing power earned it average scores in the presentation class on our benchmark tests. Hertz markets the Z-Optima as an all-in-one multimedia solution; it is essentially the same as Ergo Computing's CD-PowerBrick and MaxTech's YesBook Model X753, also reviewed in this roundup.

The Z-Optima has some impressive components. A Cirrus Logic CL-GD7543 graphics chip set and 2MB of DRAM drive the 11.2-inch active-matrix SVGA display, and storage needs are met by a 1GB Quantum hard disk. The unit also features a fixed 4X CD-ROM

SUMMARY OF FEATURES

Pentium Notebooks

Price of tested configuration For notebooks sold through resellers, assume that street prices will be 15 to 20 percent lower than list prices. Some companies factor this discount into their quoted prices; in such cases, we indicate that the cited price is a street price. Companies which sell directly to consumers have direct prices, with no expected discounting.

System weight, travel weight The system weight includes the weight of the battery. The travel weight adds the weight of the AC adapter, the power cord, and the CD-ROM drive. It does not include the weight of an external floppy disk drive or a floppy disk drive that swaps for the CD-ROM drive.

Virtual desktop When you use a notebook's LCD panel and an external monitor simultaneously, virtual desktop lets you display a higher resolution on the external monitor than the LCD panel is normally capable of producing.

Installed/maximum hard disk capacity We report capacity in megabytes (units of 1,048,576 bytes). Some manufacturers quote millions of bytes (which makes capacity appear about 5 percent larger) on spec sheets.

NTSC video in/out These ports meet specifications set by the National Television Standards Committee, and allow you to input directly from or output directly to a television set.

PC Card slots These were formerly called PCMCIA slots.

Battery hot-swapping/Smart battery Systems with battery hot-swapping capability let you change batteries without shutting down or losing data. A smart battery contains intelligent electrical circuitry that more accurately measures remaining battery capacity and provides this information to the system.

All notebooks in this roundup are capable of simultaneous external display, and all have serial, parallel, and VGA ports.

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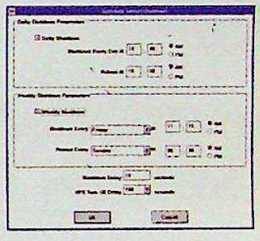
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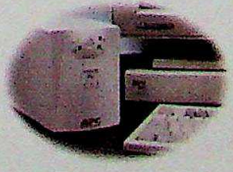
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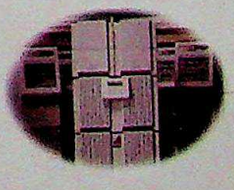
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SUMMARY OF FEATURES

Color Pentium Notebooks

■ YES ■ NO

Products listed in alphabetical order	Acer Note Light	ACW ND5123T	AMS SoundPro P54	AMS PowerCD 8500	AMS PowerCD 8550	ARMNote TS30CP90T	ARMNote TS80CD133TX	AST Ascentia J50 (PC MAGAZINE EDITORS' CHOICE)
Category	High-end value	Presentation	Low-end value	High-end value	Presentation	High-end value	Presentation	High-end value
Price (tested configuration)	$2,699 (street)	$3,489 (direct)	$2,480 (street)	$3,325 (street)	$4,395 (street)	$2,699 (direct)	$3,699 (direct)	$3,499 (street)
System weight/Travel weight (pounds)	5.8, 6.6	7.2, 8.5	6.4, 7.7	7.2, 8.5	7.5, 8.8	6.0, 6.9	7.2, 8.1	5.7, 6.5
Dimensions (HWD, in inches)	2.0 x 11.8 x 8.3	2.3 x 11.8 x 10.1	2.0 x 11.0 x 13.8	2.3 x 11.8 x 8.8	2.3 x 11.8 x 8.8	2.0 x 11.0 x 8.8	2.0 x 11.5 x 8.8	2.0 x 11.3 x 8.8
Motherboard Components								
Processor type and speed	Pentium/100	Pentium/133	Pentium/100	Pentium/120	Pentium/133	Pentium/90	Pentium/133	Pentium/133
Installed/maximum system RAM	16MB EDO, 40MB	16MB, 32MB	16MB, 40MB	16MB, 40MB	16MB, 40MB	16MB, 40MB	16MB, 64MB	16MB EDO, 40MB
Installed external RAM cache and type	N/A	256K pipelined-burst	256K asynchronous	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	256K synchronous	256K pipelined-burst
Motherboard manufacturer	Acer	Dual Technology	AMS	AMS	AMS	Compal	Twinhead	Compal
Chip set manufacturer and model	ALI M1511	SiS 5101, 5102, 5103	ACC Micro 2056	ACC Micro 2057	ACC Micro 2057	VLSI 82C594	SiS 85C5501, 5502, 5503	Intel 82430MX
BIOS manufacturer and version (or date)	Acer 2.0	AMI 2.0	Phoenix 1.03	Phoenix 4.04	Phoenix 4.04	Phoenix 4.04	Phoenix 4.04	Phoenix 4.0
Flash BIOS/Plug and Play BIOS	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Display								
LCD-panel specifications	10.4" active-matrix SVGA	12.1" active-matrix SVGA	10.4" dual-scan VGA	10.4" active-matrix SVGA	11.2" active-matrix SVGA	10.4" active-matrix SVGA	11.3" active-matrix SVGA	10.4" active-matrix SVGA
Graphics chip set manufacturer and model	C&T 65545	C&T 65550	C&T 65550	Cirrus Logic CL-GD7543	Cirrus Logic CL-GD7543	C&T 65548	Cirrus Logic CL-GD7543	C&T 65548
Graphics RAM and type	1MB DRAM	2MB EDO DRAM	1MB DRAM	2MB VRAM	2MB VRAM	1MB VRAM	1MB VRAM	1MB DRAM
Resolutions and noninterlaced refresh rates supported on external display	800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 68 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 60 Hz
Virtual desktop	■		■	■	■	■	■	■
Mass Storage								
Hard disk manufacturer and model	IBM DSOA-20810	Toshiba MK2720FC	Toshiba MK1926FCV	Toshiba MK1926FCV	Toshiba MK2720FC	Toshiba MK1926FCV	Toshiba MK2720FC	IBM DSOA-20810
Installed/maximum hard disk capacity	774MB, 1GB	1.3GB, 1.3GB	776MB, 2GB	776MB, 2GB	1.3GB, 1.3GB	774MB, 1.3GB	1.3GB, 1.3GB	774MB, 1.3GB
Floppy disk drive	Internal	Swappable	Internal	Swappable	Swappable	Internal	Swappable	Internal
Multimedia Features								
CD-ROM manufacturer and model	None	TEAC CD-44E	None	Toshiba XM-1102B	Toshiba XM-1302B	None	Matsushita UJDCD4731	None
CD-ROM speed and interface	N/A	4X ATAPI	N/A	2X ATAPI	4X ATAPI	N/A	4X ATAPI	N/A
Sound synthesis	FM	FM, wavetable	FM	FM	FM	FM, wavetable	FM	FM
Built-in speakers	■	■	■	■	■	■	■	■
Line-in/line-out jacks	■ ■	■	■		■		■ ■	■ ■
Microphone/speaker jacks	■	■ ■	■ ■	■ ■	■ ■	■	■	■ ■
NTSC video in/out				■	■		■	
Communications and Expansion								
Type of modem	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	Integrated
Infrared interface		■		■	■	■	■	■
External keyboard and mouse ports	Shared port	Both	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port
16550 UART/ECP/EPP support	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
PC Card slots	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III
Input Devices								
Full-size alphanumeric/cursor keys	■ ■	■			■	■		■
Type of integrated pointing device	Touch pad	Touch pad	Trackball	Touch pad	Touch pad	Touch pad	Touch pad	Pointing stick
Power								
Battery type	Nickel hydride	Nickel hydride	Nickel hydride	Nickel hydride	Nickel hydride	Nickel hydride	Lithium ion	Lithium ion
Rated charge time while on/off (hours:minutes)	5:00, 1:00	3:00, 1:30	6:00, 2:30	N/A, 2:00	N/A, 2:00	4:00, 1:30	N/A, 2:00	5:00, 2:30
Standby/hibernation mode	■	■ ■	■	■ ■	■ ■	■	■ ■	■ ■
Battery hot-swapping/Smart battery		■						■

N/A—Not applicable: The product does not have this feature.

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Continues

	AST Ascentia P50	Austin Edge CD (PC MAGAZINE EDITORS' CHOICE)	BSI NP8657D	BSI NP8662T	BSI NP5265A	Canon Innova Book 360CD	ChemBook 5400 Dual	ChemBook 5400 TFT	Compaq LTE 5300	Dell Latitude XPi P100SD
	Presentation	High-end value	Low-end value	High-end value	Presentation	Low-end value	Low-end value	High-end value	Presentation	Low-end value
	$4,499 (street)	$4,171 (street)	$2,605 (street)	$3,170 (street)	$3,765 (street)	$3,369 (street)	$3,075 (street)	$4,000 (street)	$6,647 (street)	$3,459 (direct)
	7.5, 8.3	7.7, 8.4	8.0, 9.1	7.9, 9.1	8.2, 9.3	6.6, 7.5	8.2, 9.3	8.2, 9.3	7.5, 8.3	6.0, 6.9
	2.3 x 11.3 x 9.0	2.3 x 11.3 x 9.0	2.3 x 11.8 x 9.3	2.3 x 11.8 x 9.3	2.5 x 12.0 x 9.0	2.0 x 11.8 x 8.8	2.5 x 11.8 x 9.0	2.5 x 11.8 x 9.0	2.0 x 12.3 x 9.0	2.3 x 11.0 x 8.8
	Pentium/133	Pentium/133	Pentium/75	Pentium/120	Pentium/150	Am5x86-P75	Pentium/75	Pentium/150	Pentium/133	Pentium/100
	16MB EDO, 40MB	16MB EDO, 40MB	16MB, 40MB	16MB, 40MB	16MB, 32MB	16MB, 32MB	16MB, 32MB	16MB EDO, 32MB	16MB, 80MB	16MB, 40MB
	256K pipelined-burst	256K pipelined-burst	256K synchronous	256K synchronous	256K asynchronous	N/A	256K asynchronous	256K asynchronous	256K pipelined-burst	256K synchronous
	Quanta	Quanta	Nan Tan	Nan Tan	Kapok	Featurtron	Kapok	Kapok	Compaq	Dell
	Intel 82430MX	Intel 82430MX	UMC 8890	UMC 8890	UMC 8890	Pico Power Redwood	UMC 8890	UMC 8890	OPTi Viper	Pico Power Vesuvius-LS
	Phoenix (2/16/96)	Phoenix 4.0	SystemSoft 1.01	SystemSoft 1.01	SystemSoft (5/16/95)	Phoenix 1.03	SystemSoft 1.10	SystemSoft 1.10	SystemSoft (3/19/96)	Phoenix/Dell 1.10
	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
	11.3" active-matrix SVGA	11.4" active-matrix SVGA	11.3" dual-scan SVGA	10.4" active-matrix SVGA	12.1" active-matrix SVGA	10.4" dual-scan VGA	11.4" dual-scan SVGA	12.1" active-matrix SVGA	12.1" active-matrix SVGA	10.3" dual-scan SVGA
	Cirrus Logic CL-GD7543	Cirrus Logic CL-GD7543	C&T 65548	C&T 65548	Cirrus Logic CL-GD7543	C&T 65545	Cirrus Logic CL-GD7543	Cirrus Logic CL-GD7543	Cirrus Logic CL-GD7543	NeoMagic MagicGraph NM2070
	1MB DRAM	2MB VRAM	1MB DRAM	1MB DRAM	2MB EDO DRAM	1MB VRAM	2MB VRAM	2MB VRAM	1MB EDO DRAM	1MB DRAM
	800 x 600 at 70 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz
	■	■	■	■	■	■	■	■	■	■
	Toshiba MK1926FCV	Toshiba MK2720FC	Seagate ST9816AG	Toshiba MK2720FC	Toshiba MK2720FC	Toshiba MK1926FCV	Hitachi DK212A-81	Toshiba MK2720FC	Toshiba MK2720FC	IBM DPRA-20810
	774MB, 2.1GB	1.3GB, 2GB	772MB, 810MB	1.3GB, 1.3GB	1.3GB, 1.3GB	776MB, 1.2GB	773MB, 810MB	1.3GB, 1.3GB	1.3GB, 1.3GB	773MB, 810MB
	Swappable	Swappable	Internal	Internal	Internal	Swappable	Internal	Internal	Swappable	Internal
	TEAC CD-44E	TEAC CD-44E	Toshiba XM-1302B	Toshiba XM-1302B	TEAC CD-44E	TEAC CD-44E	TEAC CD-44E	TEAC CD-44E	TEAC CD-44E	None
	4X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI	N/A
	FM	FM	FM	FM	FM	FM	FM	FM	FM	FM
	■	■	■	■	■	■	■	■	■	■
	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
	■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
	Integrated ■	PC Card ■	PC Card ■	PC Card ■	PC Card ■	PC Card ■	PC Card ■	PC Card ■	PC Card ■	PC Card ■
	Shared port ■■■	Shared port ■■■	Shared port ■■■	Shared port ■■■	Keyboard only ■■■	Shared port ■■■	Shared port ■■■	Shared port ■■■	Shared port ■■■	Shared port ■■■
	One Type II/III and one Type II	One Type II/III and one Type II	One Type II/III and one Type II	One Type II/III and one Type II	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III
	■■ Touch pad	■■ Touch pad	■■ Touch pad	■■ Touch pad	■■ Touch pad	■■ Touch pad	■■ Touch pad	■■ Touch pad	■■ Pointing stick	■■ Trackball
	Lithium ion 5:00, 2:30 ■■ ■■	Lithium ion 6:00, 4:00 ■■ ■■	Nickel hydride 4:00, 2:00 ■■ ■■	Nickel hydride 4:00, 2:00 ■■ ■■	Nickel hydride 3:30, 3:30 ■■ ■■	Nickel hydride 2:30, 1:30 ■■ ■■	Nickel hydride 4:30, 2:30 ■■ ■■	Nickel hydride 4:30, 2:30 ■■ ■■	Nickel hydride 1:30, 1:30 ■■ ■■	Lithium ion 2:30, 2:30 ■■ ■■

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SUMMARY OF FEATURES

Color Pentium Notebooks

■ YES ■ NO
Products listed in alphabetical order

	Dell Latitude XPi P133ST	DFI 7200TC	Digital HiNote VP CSS5100	Digital HiNote VP CTS5100	Digital HiNote Ultra II CTS5120	DTK DTN-5P120C	Ergo CD-PowerBrick	FutureMate 5813T
Category	High-end value	Presentation	Low-end value	High-end value	Lightweight	Presentation	Presentation	Presentation
Price (tested configuration)	$4,859 (direct)	$4,199 (street)	$2,499 (street)	$2,999 (street)	$4,799 (street)	$3,600 (street)	$4,195 (street)	$3,329 (street)
System weight/Travel weight (pounds)	6.0, 6.9	7.1, 8.1	6.0, 6.7	6.0, 6.7	4.0, 4.7	7.9, 9.0	7.6, 8.7	7.1, 8.4
Dimensions (HWD, in inches)	2.3 x 11.0 x 8.8	2.3 x 11.5 x 8.8	1.8 x 11.0 x 9.0	1.9 x 11.0 x 9.0	1.3 x 11.0 x 8.8	2.3 x 11.8 x 9.2	2.3 x 11.8 x 8.9	2.3 x 11.8 x 10.1
Motherboard Components								
Processor type and speed	Pentium/133	Pentium/133	Pentium/100	Pentium/100	Pentium/120	Pentium/120	Pentium/120	Pentium/133
Installed/maximum system RAM	16MB, 40MB	16MB, 64MB	16MB EDO, 40MB	16MB EDO, 40MB	16MB, 40MB	16MB, 40MB	16MB, 40MB	16MB EDO, 32MB
Installed external RAM cache and type	256K synchronous	256K asynchronous	N/A	N/A	256K pipelined-burst	256K synchronous	256K synchronous	256K pipelined-burst
Motherboard manufacturer	Dell	Twinhead	Compal	Compal	Full Power Investment	Nan Tan	GVC	Dual Technology
Chip set manufacturer and model	Pico Power Vesuvius-LS	SiS 83C5501	Intel 82430MX	Intel 82430MX	Cirrus Logic Golden Gate	UMC 8890	OPTi Viper	SiS 5101, 5102, 5103
BIOS manufacturer and version (or date)	Phoenix 1.10 A00	Phoenix 4.04	Phoenix 4.0	Phoenix 4.0	SystemSoft 2.03	SystemSoft 1.01	Phoenix 4.0	AMI (3/21/96)
Flash BIOS/Plug and Play BIOS	■■	■■	■■	■■	■■	■■	■■	■■
Display								
LCD-panel specifications	11.3" active-matrix SVGA	10.4" active-matrix SVGA	10.4" dual-scan SVGA	10.4" active-matrix SVGA	10.4" active-matrix SVGA	10.5" active-matrix SVGA	11.3" active-matrix SVGA	12.1" active-matrix SVGA
Graphics chip set manufacturer and model	NeoMagic MagicGraph NM2070	Cirrus Logic CL-GD7543	C&T 65548	C&T 65548	C&T 65548	C&T 65548	Cirrus Logic CL-GD7543	C&T 65550
Graphics RAM and type	1MB EDO DRAM	1MB DRAM	1MB VRAM	1MB VRAM	1MB SDRAM	1MB DRAM	2MB DRAM	1MB VRAM
Resolutions and noninterlaced refresh rates supported on external display	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 56 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 60 Hz
Virtual desktop	■	■	■	■	■	■	■	■
Mass Storage								
Hard disk manufacturer and model	IBM DPRA-21215	Toshiba MK2720FC	IBM DSOA-20810	IBM DSOA-20810	IBM DSOA-21080	Toshiba MK2720FC	Toshiba MK1926FCV	Toshiba MK1926FCV
Installed/maximum hard disk capacity	1.2GB, 1.2GB	1.3GB, 1.3GB	774MB, 1.3GB	774MB, 1.3GB	1GB, 1.3GB	1.3GB, 1.3GB	776MB, 1GB	776MB, 1.3GB
Floppy disk drive	Internal	Swappable	Swappable	Swappable	Swappable	Internal	Internal	Swappable
Multimedia Features								
CD-ROM manufacturer and model	None	Matsushita UJDCD4731	None	None	Toshiba XM-1202B	Toshiba XM-1302B	TEAC CD-44E	TEAC CD-44E
CD-ROM speed and interface	N/A	4X ATAPI	N/A	N/A	4X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI
Sound synthesis	FM	FM	FM	FM	FM	FM	FM	FM
Built-in speakers	■	■	■	■	▫	■	■	■
Line-in/line-out jacks	■▫	■▫	▫▫	▫▫	■▫	■▫	■■	▫■
Microphone/speaker jacks	■■	■■	▫▫	■■	▫■	■■	■▫	■■
NTSC video in/out	▫▫	▫■	▫▫	▫▫	▫▫	▫▫	▫■	▫▫
Communications and Expansion								
Type of modem	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card
Infrared interface	■	■	▫	■	■	■	■	■
External keyboard and mouse ports	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Both
16550 UART/ECP/EPP support	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
PC Card slots	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	One Type II/III and one Type II	Two Type II or one Type III	Two Type II or one Type III
Input Devices								
Full-size alphanumeric/cursor keys	▫▫	▫▫	■■	▫■	▫■	▫■	■▫	■▫
Type of integrated pointing device	Trackball	Touch pad	Touch pad	Touch pad	Trackball	Touch pad	Touch pad	Touch pad
Power								
Battery type	Lithium ion	Lithium ion	Nickel hydride	Nickel hydride	Lithium ion	Nickel hydride	Nickel hydride	Nickel hydride
Rated charge time while on/off (hours:minutes)	2:30, 2:30	9:00, 2:00	3:50, 2:00	3:50, 2:00	3:00, 3:00	4:00, 2:00	2:10, 1:30	3:00, 2:00
Standby/hibernation mode	■▫	■▫	■■	■■	■■	▫▫	■▫	■■
Battery hot-swapping/Smart battery	▫■	▫▫	▫■	▫	■■	▫■	▫■	▫▫

N/A—Not applicable: The product does not have this feature.

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Continues

Gateway Solo S5-120	Gateway Solo S5-133	Hertz Z-Optima NB P150c	HP OmniBook 5500 CS	HP OmniBook 5500 CT	IBM ThinkPad 365XD	IBM ThinkPad 560 (PC MAGAZINE EDITORS' CHOICE)	IBM ThinkPad 760ED (PC MAGAZINE EDITORS' CHOICE)	Keydata Keynote GT	Maximus MediaNote CD Book
High-end value	Presentation	Presentation	Low-end value	Presentation	High-end value	Lightweight	Presentation	High-end value	High-end value
$4,128 (direct)	$4,499 (direct)	$3,995 (direct)	$3,700 (street)	$6,120 (street)	$3,699 (street)	$3,749 (street)	$6,999 (street)	$3,795 (direct)	$3,795 (direct)
6.4, 7.5	5.6, 6.6	8.0, 9.0	7.2, 8.0	7.1, 8.0	6.3, 7.2	4.1, 4.8	7.5, 8.1	7.1, 8.0	7.6, 8.9
2.0 x 11.8 x 8.8	2.0 x 11.8 x 8.8	2.3 x 11.9 x 9.0	2.0 x 12.0 x 9.0	2.0 x 11.5 x 9.0	2.0 x 11.6 x 8.3	1.3 x 11.8 x 8.8	2.3 x 11.6 x 8.5	2.3 x 11.8 x 8.8	2.5 x 11.8 x 9.3
Pentium/120	Pentium/133	Pentium/150	Pentium/100	Pentium/133	Pentium/120	Pentium/120	Pentium/133	Pentium/120	Pentium/133
16MB, 40MB	16MB, 40MB	16MB EDO, 40MB	16MB EDO, 64MB	16MB EDO, 64MB	16MB EDO, 40MB	16MB EDO, 40MB	16MB EDO, 80MB	16MB EDO, 72MB	16MB, 64MB
256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	N/A	N/A	256K pipelined-burst	256K asynchronous	256K asynchronous
Sanyo	Sanyo	GVC	Twinhead	Twinhead	IBM	IBM	IBM	Chicony	Sunrex
OPTi Viper	OPTi Viper	OPTi Viper	OPTi Viper	OPTi Viper	Intel 82430MX	Intel 82430MX	Intel 82430MX	OPTi Viper	VIA VT82C575, 576, 577
SystemSoft 1.07	SystemSoft 1.07	Phoenix 4.0	SystemSoft 2.0	SystemSoft 2.0	IBM 1.03	IBM 1.03	IBM 1.03	Phoenix 4.0	AMI (3/26/96)
■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
10.4" active-matrix SVGA	11.3" active-matrix SVGA	11.2" active-matrix SVGA	11.4" dual-scan SVGA	12.1" active-matrix SVGA	10.4" active-matrix SVGA	12.1" active-matrix SVGA	12.1" active-matrix SVGA	12.0" active-matrix SVGA	12.1" active-matrix SVGA
C&T 65550	C&T 65548	Cirrus Logic CL-GD7543	C&T 65550	C&T 65550	Trident Cyber9320	Trident Cyber9382	Trident Cyber9385	C&T 65548	C&T 65548
1MB VRAM	1MB VRAM	2MB DRAM	1MB DRAM	1MB DRAM	1MB DRAM	1MB VRAM	2MB VRAM	1MB DRAM	1MB DRAM
800 x 600 at 72 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 85 Hz, 1,024 x 768 at 85 Hz	800 x 600 at 85 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 54 Hz
■	■	■	■	■	■	■	■	■	■
Toshiba MK1926FCV	IBM DBOA-2720	Quantum Europa1080A	Toshiba MK1926FCV	Toshiba MK2720FC	IBM DSOA-21080	IBM DSOA-20810	IBM DPRA-21215	Toshiba MK2720FC	Toshiba MK2720FC
776MB, 1.3GB	686MB, 2GB	1GB, 1.3GB	1.3GB, 1.3GB	1.3GB, 1.3GB	1GB, 1.1GB	774MB, 1.1GB	1.2GB, 1.2GB	1.3GB, 1.3GB	1.3GB, 1.3GB
Swappable	Swappable	Internal	Swappable	Swappable	Swappable	External	Swappable	Swappable	Internal
TEAC CD-44E	Matsushita UJDCD4720	TEAC CD-44E	Toshiba XM-1302B	Toshiba XM-1302B	TEAC CD-44E	None	TEAC CD-44E	TEAC CD-44E	Toshiba XM-1302B
4X ATAPI	6X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI	N/A	4X ATAPI	4X ATAPI	4X ATAPI
FM	FM	FM	FM, wavetable	FM	FM	FM, wavetable	Wavetable	FM	FM
■	■	■	■	■	■	■	■	■	■
■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	Integrated	PC Card	PC Card
■	■	■	■	■	■	■	■	■	■
Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port
■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■	■■■
Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	One Type II and one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III
■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
Touch pad	Touch pad	Touch pad	Pointing stick	Pointing stick	Pointing stick	Pointing stick	Pointing stick	Touch pad	Touch pad
Lithium ion	Lithium ion	Nickel hydride	Lithium ion	Lithium ion	Nickel hydride	Lithium ion	Lithium ion	Lithium ion	Nickel hydride
3:00, 2:30	3:00, 1:00	3:50, 2:00	5:30, 4:00	5:30, 4:00	1:30, 1:15	2:30, 1:30	3:00, 2:30	2:00, 2:00	2:00, 1:00
■■	■■	■■	■■	■■	■■	■■	■■	■■	■■
■■	■■	■■	■■	■■	■■	■■	■■	■■	■■

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SUMMARY OF FEATURES

Color Pentium Notebooks

PC MAGAZINE EDITORS' CHOICE

■ YES ■ NO
Products listed in alphabetical order

	MaxTech YesBook Model X753	Micro Express NP8000-P120	Micro Express NP8600-P120	Micron Millennia TransPort	NEC Versa 4000C	NEC Versa 4080H	Olivetti Echos P100D	Olivetti Echos P133S
Category	High-end value	Low-end value	Presentation	Presentation	High-end value	Presentation	Low-end value	High-end value
Price (tested configuration)	$2,899 (street)	$2,598 (direct)	$2,999 (direct)	$5,198 (direct)	$4,490 (street)	$4,790 (street)	$2,499 (street)	$4,999 (street)
System weight/Travel weight (pounds)	7.7, 8.7	6.7, 7.6	7.9, 9.0	7.5, 8.3	7.0, 7.7	6.6, 7.4	6.3, 7.5	6.7, 7.9
Dimensions (HWD, in inches)	2.3 x 11.8 x 9.0	2.0 x 11.3 x 8.8	2.3 x 11.8 x 9.0	2.1 x 11.8 x 9.3	2.3 x 11.8 x 9.5	2.3 x 11.8 x 9.5	2.0 x 11.3 x 8.9	2.0 x 11.3 x 8.9
Motherboard Components								
Processor type and speed	Pentium/120	Pentium/120	Pentium/120	Pentium/133	Pentium/75	Pentium/120	Pentium/100	Pentium/133
Installed/maximum system RAM	16MB EDO, 40MB	16MB EDO, 40MB	16MB, 40MB	16MB EDO, 48MB	16MB, 40MB	16MB, 40MB	16MB, 40MB	16MB, 40MB
Installed external RAM cache and type	256K pipelined-burst	256K synchronous	256K synchronous	256K pipelined-burst	256K pipelined-burst	256K pipelined-burst	N/A	256K asynchronous
Motherboard manufacturer	GVC	Chaplet	NTC	Sanyo	NEC	NEC	Chaplet	Chaplet
Chip set manufacturer and model	OPTi Viper	UMC 8891, 8892	UMC 8891, 8892	Intel 82430MX	Pico Power Golden Gate	Pico Power Golden Gate	UMC 8890	UMC 8890
BIOS manufacturer and version (or date)	Phoenix 4.04	Phoenix 4.04	SystemSoft 1.20	Phoenix 4.05	Phoenix 4.0	Phoenix 4.0	Phoenix 4.04	Phoenix 4.04
Flash BIOS/Plug and Play BIOS	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Display								
LCD-panel specifications	11.3" active-matrix SVGA	10.4" dual-scan VGA	10.4" active-matrix SVGA	12.1" active-matrix SVGA	10.2" active-matrix VGA	10.4" active-matrix SVGA	10.4" dual-scan SVGA	11.8" active-matrix SVGA
Graphics chip set manufacturer and model	Cirrus Logic CL-GD7543	C&T 65550	C&T 65548	Cirrus Logic CL-GD7548	C&T 65545	C&T 65545	C&T 65548	C&T 65548
Graphics RAM and type	1MB DRAM	1MB DRAM	1MB DRAM	1MB EDO DRAM	1MB DRAM	1MB DRAM	1MB DRAM	1MB DRAM
Resolutions and noninterlaced refresh rates supported on external display	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz
Virtual desktop	■	■	■	■	■	■	■	■
Mass Storage								
Hard disk manufacturer and model	Toshiba MK2720FC	Quantum Europa 810AT	Toshiba MK2720FC	Toshiba MK2720FC	Toshiba MK1926FCV	IBM DSOA-21080	Toshiba MK1926FCV	Toshiba MK2720FC
Installed/maximum hard disk capacity	1.3GB, 1.3GB	778MB, 1.3GB	1.3GB, 1.3GB	1.3GB, 1.3GB	776MB, 1GB	1GB, 1GB	776MB, 1GB	1.3GB, 1.3GB
Floppy disk drive	Internal	Swappable	Swappable	Swappable	Swappable	Swappable	Swappable	Swappable
Multimedia Features								
CD-ROM manufacturer and model	TEAC CD-44E	TEAC CD-44E	Toshiba XM-1302B	Sanyo CRD-S56PMC	TEAC CD-44E	TEAC CD-44E	None	TEAC CD-44E
CD-ROM speed and interface	4X ATAPI	4X ATAPI	4X ATAPI	6X ATAPI	4X ATAPI	4X ATAPI	N/A	4X ATAPI
Sound synthesis	FM	FM, wavetable	FM, wavetable	FM	FM	FM	FM	FM
Built-in speakers	■	■	■	■	■	■	■	■
Line-in/line-out jacks	■ ■	■	■	■	■	■	■	■
Microphone/speaker jacks	■	■ ■	■ ■	■ ■	■ ■	■ ■	■	■
NTSC video in/out	■	■	■	■	■	■	■	■
Communications and Expansion								
Type of modem	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card	PC Card
Infrared interface	■	■	■	■	■	■	■	■
External keyboard and mouse ports	Shared port	Shared port	Shared port	Both	Shared port	Shared port	Shared port	Shared port
16550 UART/ECP/EPP support	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■
PC Card slots	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	One Type II or one Type III	Two Type II or one Type III
Input Devices								
Full-size alphanumeric/cursor keys	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Type of integrated pointing device	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Touch pad
Power								
Battery type	Nickel hydride	Nickel hydride	Nickel hydride	Lithium ion	Lithium ion	Lithium ion	Nickel hydride	Nickel hydride
Rated charge time while on/off (hours:minutes)	3:30, 1:30	2:00, 2:00	2:00, 2:00	5:00, 2:30	2:30, 2:30	2:30, 2:30	4:00, 3:00	4:00, 3:00
Standby/hibernation mode	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■
Battery hot-swapping/Smart battery	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■	■ ■

N/A—Not applicable: The product does not have this feature.

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Polywell Poly 500NB5	Samsung SENS 810 (P-100)	Samsung SENS 810 (P-133)	TI Extensa 515	TI Extensa 570CDT	Toshiba Satellite Pro 420CDT	Toshiba Tecra 720CDT	Twinhead Slimnote 875CX	Twinhead Slimnote 8100TX	Twinhead Slimnote 8120TV
High-end value	Low-end value	Presentation	Low-end value	High-end value	High-end value	Presentation	Low-end value	High-end value	Presentation
$3,300 (street)	$3,667 (street)	$4,499 (street)	$2,299 (street)	$3,999 (street)	$4,198 (street)	$6,299 (street)	$2,965 (street)	$3,775 (street)	$4,195 (street)
7.9, 9.0	8.7, 9.6	8.7, 9.6	5.9, 6.6	7.4, 8.5	7.5, 8.6	8.2, 10.3	7.4, 8.3	7.3, 8.2	7.2, 8.1
2.3 x 11.9 x 9.0	2.3 x 11.5 x 9.5	2.3 x 11.5 x 9.5	2.0 x 11.7 x 8.3	2.5 x 11.5 x 8.8	2.1 x 11.9 x 9.3	2.5 x 11.8 x 9.1	2.0 x 11.5 x 8.0	2.0 x 11.5 x 8.0	2.0 x 11.5 x 8.8
Pentium/133	Pentium/100	Pentium/133	Pentium/100	Pentium/100	Pentium/100	Pentium/133	Pentium/75	Pentium/100	Pentium/120
16MB, 32MB	16MB EDO, 40MB	16MB EDO, 40MB	16MB EDO, 40MB	16MB, 40MB	16MB EDO, 40MB	16MB EDO, 144MB	16MB, 64MB	16MB, 64MB	16MB, 64MB
256K asynchronous	256K pipelined-burst	256K pipelined-burst	N/A	256K synchronous	N/A	256K pipelined-burst	256K synchronous	256K synchronous	256K synchronous
Kapok	Samsung	Samsung	Acer	First International Computer	Toshiba	Toshiba	Twinhead	Twinhead	Twinhead
UMC 8890	Intel 82430MX	Intel 82430MX	ALI ALI-2	OPTi Viper	Toshiba	Toshiba	SiS 550	SiS 550	SiS 550
SystemSoft 1.01	Phoenix 4.0	Phoenix 4.0	Acer 2.0	Phoenix 4.0	Toshiba 5.11	Toshiba 5.10	Phoenix 4.04	Phoenix 4.04	Phoenix 4.04
10.4" active-matrix SVGA	11.4" dual-scan SVGA	11.4" active-matrix SVGA	10.4" dual-scan VGA	10.3" active-matrix SVGA	11.5" active-matrix SVGA	12.1" active-matrix XVGA	10.4" dual-scan SVGA	10.4" active-matrix SVGA	11.3" active-matrix SVGA
Cirrus Logic CL-GD7543	Cirrus Logic CL-GD7543	Cirrus Logic CL-GD7543	C&T 65545	Cirrus Logic CL-GD7543	C&T 65550	C&T 65550	Cirrus Logic CL-GD7543	Cirrus Logic CL-GD7543	Cirrus Logic CL-GD7543
2MB VRAM	1MB VRAM	1MB VRAM	1MB DRAM	1MB DRAM	2MB EDO DRAM	2MB EDO DRAM	1MB DRAM	1MB DRAM	1MB DRAM
800 x 600 at 75 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 60 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 70 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 72 Hz	800 x 600 at 72 Hz, 1,024 x 768 at 72 Hz
Hitachi DK212A-10	IBM DPRA-20810	Toshiba MK2720FC	IBM DSOA-20810	IBM DPRA-21215	Toshiba MK1926FCV	Toshiba MK2720FC	Seagate ST9816AG	Seagate ST9816AG	Toshiba MK2720FC
1GB, 1.3GB	773MB, 1.3GB	1.3GB, 1.3GB	774MB, 810MB	1.1GB, 1.2GB	776MB, 1.3GB	1.3GB, 1.6GB	772MB, 810MB	772MB, 1.3GB	1.3GB, 1.3GB
Swappable	Swappable	Swappable	Internal	Swappable	External	Swappable	Swappable	Swappable	Swappable
TEAC CD-44E	Toshiba XM-1302B	Toshiba XM-1302B	None	Matsushita UJDCD4722	Toshiba XM-1402B	Toshiba XM-1402B	Matsushita UJDCD4731	Matsushita UJDCD4731	Matsushita UJDCD4731
4X ATAPI	4X ATAPI	4X ATAPI	N/A	4X ATAPI	6X ATAPI	6X ATAPI	4X ATAPI	4X ATAPI	4X ATAPI
FM	FM	FM, wavetable	FM	FM	FM	FM, wavetable	FM	FM	FM
PC Card	Integrated	Integrated	PC Card	PC Card	PC Card	Integrated	PC Card	PC Card	PC Card
Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port	Shared port
Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III
Touch pad	Touch pad	Touch pad	Touch pad	Touch pad	Pointing stick	Pointing stick	Touch pad	Touch pad	Touch pad
Nickel hydride 3:20, 2:10	Nickel hydride 3:00, 1:50	Nickel hydride 3:00, 1:50	Nickel hydride 7:00, 2:00	Nickel hydride 3:00, 2:00	Lithium ion 8:00, 3:00	Lithium ion 10:00, 4:00	Lithium ion 8:00, 2:00	Lithium ion 8:00, 2:00	Lithium ion 8:00, 2:00

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SUMMARY OF FEATURES *Ends*

Color Pentium Notebooks

PC MAGAZINE EDITORS' CHOICE

■ YES ▒ NO
Products listed in alphabetical order

	Unisys Aquanta MN	WinBook XP5 P100	WinBook XP5 P120	WinBook FX
Category	High-end value	Low-end value	High-end value	Presentation
Price (tested configuration)	$4,694 (list)	$2,599 (direct)	$3,679 (direct)	$4,079 (direct)
System weight/Travel weight (pounds)	7.0, 7.7	6.3, 7.1	5.9, 6.7	7.6, 8.3
Dimensions (HWD, in inches)	2.0 x 11.8 x 9.0	2.0 x 11.4 x 8.8	2.0 x 11.4 x 8.8	2.3 x 11.3 x 9.0
Motherboard Components				
Processor type and speed	Pentium/120	Pentium/100	Pentium/120	Pentium/133
Installed/maximum system RAM	16MB, 40MB	16MB, 32MB	16MB, 32MB	16MB EDO, 40MB
Installed external RAM cache and type	256K synchronous	256K synchronous	256K synchronous	256K pipelined-burst
Motherboard manufacturer	Acer	ASE Technology	ASE Technology	Quanta
Chip set manufacturer and model	ALI M1451C	ACC Micro 2057	ACC Micro 2057	Intel 82430MX
BIOS manufacturer and version (or date)	Phoenix 4.0	Phoenix 1.03	Phoenix 1.03	Phoenix 4.0
Flash BIOS/Plug and Play BIOS	■■	▒■	▒■	■■
Display				
LCD-panel specifications	10.5" active-matrix SVGA	10.4" dual-scan VGA	11.4" active-matrix SVGA	11.3" active-matrix SVGA
Graphics chip set manufacturer and model	C&T 65550	C&T 65535	C&T 65548	Cirrus Logic CL-GD7543
Graphics RAM and type	1MB DRAM	1MB DRAM	1MB DRAM	1MB DRAM
Resolutions and noninterlaced refresh rates supported on external display	800 x 600 at 75 Hz, 1,024 x 768 at 60 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz	800 x 600 at 75 Hz, 1,024 x 768 at 75 Hz
Virtual desktop	■	■	■	■
Mass Storage				
Hard disk manufacturer and model	IBM DPRA-21215	Toshiba MK1926FCV	Toshiba MK2720FC	Toshiba MK2720FC
Installed/maximum hard disk capacity	1.1GB, 1.3GB	776MB, 1.3GB	1.3GB, 1.3GB	1.3GB, 1.3GB
Floppy disk drive	Swappable	Internal	Internal	Swappable
Multimedia Features				
CD-ROM manufacturer and model	TEAC CD-44E	None	None	TEAC CD-44E
CD-ROM speed and interface	4X ATAPI	N/A	N/A	4X ATAPI
Sound synthesis	FM	FM	FM	FM
Built-in speakers	■	■	■	■
Line-in/line-out jacks	■■	■■	■■	■■
Microphone/speaker jacks	■▒	▒▒	▒▒	■▒
NTSC video in/out	▒▒	▒▒	▒▒	▒▒
Communications and Expansion				
Type of modem	PC Card	Integrated	Integrated	PC Card
Infrared interface	■	▒	▒	■
External keyboard and mouse ports	Shared port	Shared port	Shared port	Shared port
16550 UART/ECP/EPP support	■■■	■■■	■■■	■■■
PC Card slots	Two Type II or one Type III	Two Type II or one Type III	Two Type II or one Type III	One Type II/III and one Type II
Input Devices				
Full-size alphanumeric/cursor keys	▒■	■■	■■	▒▒
Type of integrated pointing device	Touch pad	Pointing stick	Pointing stick	Pointing stick and touch pad
Power				
Battery type	Lithium ion	Lithium ion	Lithium ion	Lithium ion
Rated charge time while on/off (hours:minutes)	2:00, 2:00	4:00, 2:00	4:00, 2:00	6:00, 4:00
Standby/hibernation mode	■■	■■	■▒	■■
Battery hot-swapping/Smart battery	▒■	▒▒	▒▒	■■

N/A—Not applicable: The product does not have this feature.

drive, a fixed floppy disk drive, 16-bit audio with two speakers, a touch pad, and a keyboard with two Windows 95–specific keys.

In addition to standard I/O ports, the unit has an IrDA infrared port, an NTSC- and PAL-compatible video-out port, and a docking station connector. The unit's PC Card slot can hold either two Type II PC Cards or one Type III card. The system also came with a standard 28.8/14.4-Kbps PC Card fax modem.

Within its presentation class, the Z-Optima performed well, earning average scores across our tests. Using a nickel hydride battery, the system lasted 1:47 on our BatteryMark test. The Z-Optima's travel weight is 9 pounds.—*RSA*

Hertz Z-Optima NB P150c. Direct price: $3,995. Hertz Computer Corp., New York, NY. *(No Indian partner.)*

Hewlett-Packard Co.

OmniBook 5500 CS, OmniBook 5500 CT

Hewlett-Packard Co.'s OmniBook 5500 CT presentation notebook ($6,120 street) and OmniBook 5500 CS ($3,700 street) low-end value machine are well-built notebooks with plenty of features, including an NTSC-compatible S-Video–out connector. HP has designed the units with corporate sales force automation in mind; each kept pace with its respective competition on our benchmark tests.

The 5500 CT is a Pentium/133-based system with a 12.1-inch active-matrix SVGA screen. The 100-MHz 5500 CS has an 11.4-inch dual-scan SVGA panel. Both OmniBooks use Chips and Technologies' 65548 graphics chip set with 1MB of DRAM, which enables the display driver to create a virtual desktop with external resolutions up to 1,280-by-1,024.

SERVICE & RELIABILITY
Hewlett-Packard Co.

Reliability	Average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Average

Weighing in at 8 pounds (travel

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eight), the two OmniBooks are well quipped, with 256K of pipelined-burst 2 cache, two Type II PC Card slots, a ointing stick, the usual array of ports lus a MIDI/game port, and 16-bit sound, ith built-in speakers at the wrist rest. he 5500 CT came with a 1.3GB Toshiba IK2720FC hard disk, and the 5500 CS sed a 776MB MK1926FCV Toshiba isk. We also received a 28.8/14.4-Kbps C Card fax modem (included in the bove price), but they must be purchased om a third party; they are not available om HP. A single modular slot in the ront of the unit can accommodate an in- ernal floppy disk drive, 4X CD-ROM rive, or second battery. The floppy disk odule can also be attached to the paral- el port to function as an external drive.

The two units performed well within heir classes, garnering mostly average cores. Exceptions included an above-av- rage Graphics WinMark 96 result for the 33-MHz unit and the 100-MHz model's bove-average scores on both CPUmark easures and our CD-ROM WinMark 96 ests, as well as its below-average Disk VinMark 96 score. Using lithium ion bat- eries, the 5500 CS and the 5500 CT lasted 49 and 2:26, respectively, on our Bat- eryMark test.—*CL*

mniBook 5500 CT. Street price: $6,120. **Om- iBook 5500 CS.** Street price: $3,700. ewlett-Packard Co., Palo Alto, CA; http://www.hp .com.

(Indian subsidiary Hewlett-Packard India, New Delhi; partners CMS, Bombay; ECIL, Hyderabad; Godrej Trading, Bombay; HCL-HP, HCL-FLS, PCL, New Delhi, Zenith Computers, Bombay.)

IBM Personal Computer Co.

ThinkPad 560, ThinkPad 760ED, ThinkPad 365XD

PC MAGAZINE EDITORS' CHOICE

In recent years we've come to expect IBM Personal Computer Co. to impress us with innovative notebooks. As a group, the $3,699 high-end value ThinkPad 365XD, the $3,749 lightweight ThinkPad 560, and the $6,999 presentation-class ThinkPad 760ED do not disappoint, each offering solid design and a good feature set. Both the 560 and the 760ED are Editors' Choices in this roundup. Moreover, the 133-MHz 760ED truly excelled on our tests; its fellow ThinkPads turned in mostly average performance.

The 8.1-pound (travel weight) 760ED is an all-out muscle machine with as many features as IBM could squeeze in. It offers a 1.2GB hard disk, front and rear infrared ports, a keyboard that tilts up when the unit is opened, NTSC video-in and video-out ports, a digital LCD battery gauge, and a game/MIDI port. The unit also features an IBM Media Processor, which acts as a 28.8/14.4-Kbps data/fax modem and provides audio and telephony features. Its 12.1-inch SVGA TFT black-matrix screen is powered by a 64-bit Trident 9385 graphics chip set with 2MB of VRAM. The 4X CD-ROM module can be swapped for a floppy disk drive module, or the unit can be used with a separate external floppy disk drive.

The 760ED's benchmark scores were simply stunning. It posted the best Winstone 96, Winstone 32, Disk WinMark 96, and Graphics WinMark 96 scores in this roundup. Its CD-ROM WinMark 96 score was average. Despite its power, the unit, which uses a lithium ion battery, posted a highly impressive BatteryMark time of 2:53.

The focus of the 120-MHz 560 is portability, not performance: It is just an inch and a quarter thick and lasted 3:38 on our BatteryMark test—one of the best times in this roundup—yet offers a dazzling 12.1-inch SVGA active-matrix display and a full-size keyboard. Its travel weight is just 4.8 pounds, a figure aided by a very compact AC adapter brick. The unit also came with a 774MB hard disk, an infrared port, and an expansion port (for a docking station or a port replicator) and uses an 11-ounce external floppy disk drive. Its performance is competitive: Its Winstone score was below average for its class, but all other scores were average. The 560 replaces the ThinkPad 701C "butterfly," whose folding keyboard no longer makes sense with a larger screen.

SERVICE & RELIABILITY
IBM Personal Computer Co.

Reliability	Better than average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Average

Targeted at the mainstream business market, the 7.2-pound (travel weight), 120-MHz 365XD features a 10.4-inch active-matrix screen and a 1GB hard disk. It also features the familiar ThinkPad flip-up keyboard and TrackPoint III pointing device, and it uses a fixed 4X CD-ROM drive and an external floppy disk drive. It also offers a built-in 16-bit audio system, a single speaker, and an IrDA infrared port. The 365XD posted average scores on all benchmark tests, and using a nickel hydride battery, it ran for 2:20 on our BatteryMark test.—*RSA*

ThinkPad 560. Street price: $3,749. **ThinkPad 760ED.** Street price: $6,999. **ThinkPad 365XD.** Street price: $3,699. IBM Personal Computer Co., Somers, NY; http://www.pc.ibm.com.

(Indian partners Melstar, Bombay; TISL, Bangalore.)



HP 5500 CT, IBM 560.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
HP OmniBook 5500 CS	Good	Good
HP OmniBook 5500 CT	Good	Good
IBM ThinkPad 560	Fair	Excellent
IBM ThinkPad 760ED	Excellent	Excellent
IBM ThinkPad 365XD	Good	Good

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Keydata International Inc.

Keynote GT

Keydata's Keynote GT notebook ($3,795 direct) is an average performer with an attractive array of features and options. Aimed at corporate users, this high-end value notebook (8 pounds travel weight) comes with a Pentium/120 CPU, 256K of asynchronous L2 cache, and an eye-catching 12-inch active-matrix SVGA display. Keydata is returning to the direct consumer PC market after a three-year absence, during which it focused on government contracts.

The Keynote came equipped with a 1.3GB Toshiba hard disk, two Type II (or one Type III) PC Card slots, 16-bit sound, and a 28.8/14.4-Kbps V.34 PC Card fax modem. The unit's stereo speakers are embedded in the wrist rest, along with a touch pad. The system has all standard ports, as well as audio in/out and a 115.2-Kbps infrared port. The Keynote also comes with a carrying case and a car adapter (an $88 option, included in the price quoted above).

The unit's internal floppy disk drive can be replaced by a 4X CD-ROM drive, a second lithium battery, or a second hard disk. Options include a port replicator ($140); according to Keydata, a full-size docking station with expansion slots will be available by the time you read this.

The system was a fairly good performer on our tests. Its scores were average except for a below-average result on our Disk WinMark 96 tests. In our BatteryMark test, the unit's battery lasted 1:59. —*CL*

Keynote GT. Direct price: $3,795. Keydata International Inc., South Plainfield, NJ; keysales@ix.netcom.com.
(No Indian partner.)

Maximus Computers Inc.

MediaNote CD Book

Maximus Computers' 133-MHz Pentium MediaNote CD Book ($3,795 direct price) will get the job done for its intended market of business users. This high-end value portable boasts such features as a 12.1-inch SVGA active-matrix display, plus a four-year warranty. It was a mostly average performer on our benchmark tests.

This notebook has some well-thought-out design features, including its combination quad-speed CD-ROM drive and floppy disk drive—a great use of space, and a feature that's unique to this machine. The wrist rest contains speakers and a microphone, and the removable keyboard allows easy access to the processor and memory for future upgrades. On the downside, the MediaNote's case leaves input/output ports exposed at all times, and a plastic panel on the hard disk houses the speaker volume control and audio jack, making hard-disk swaps difficult.



Keydata, Maximus, MaxTech.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Keydata Keynote GT	Good	Good
Maximus MediaNote CD Book	Good	Good
MaxTech YesBook Model X753	Good	Good

The MediaNote (with a travel weight of 8.9 pounds) also includes a 1.3GB Toshiba hard disk, two stacked Type II PC Card slots, a touch pad, and a 28.8/14.4-Kbps PC Card V.34 fax modem.

The MediaNote performed fairly well on our benchmark tests. It garnered mostly average results, with three exceptions: Both CPUmark scores and the system's Winstone 32 score were below average. Using a nickel hydride battery, the unit lasted 2 hours on our BatteryMark tests.—*CL*

MediaNote CD Book. Direct price: $3,795. Maximus Computers Inc., Monrovia, CA; http://www.maximuspc.com.
(No Indian partner.)

MaxTech Corp.

YesBook Model X753

If you're looking for a bargain-priced high-end machine, consider MaxTech's YesBook Model X753, which sells at a surprisingly low $2,899 street price. This 120-MHz Pentium unit has an 11.3-inch SVGA Mitsubishi active-matrix display, a 1.3GB Toshiba hard disk, a TEAC 4X CD-ROM drive, and even a composite NTSC video-out port, so it can double as a presentation machine. The YesBook performed well on most of our benchmark tests.

MaxTech's price is especially surprising given that Ergo and Hertz sell the same notebook, with comparable components, at significantly higher prices: $4,195 and $3,995, respectively. Both versions are reviewed in this roundup. (GVC Corp. manufactures the notebook.)

Loaded with 256K of pipelined-burst L2 cache, the YesBook posted above-average scores on our CPUmark tests. Other test scores were average for its high-end value class except for a below-average result on our Graphics WinMark 96 tests. Using a nickel hydride battery, the YesBook managed a 1:45 result on our BatteryMark tests.

The tested system also came with 1MB DRAM to support the Cirrus Logic 7543 graphics chip set. (MaxTech will upgrade this to 2MB, for the same price, by the time you read this review.) The YesBook has an 8.7-pound travel weight.—*BB*

YesBook Model X753. Street price: $2,899. MaxTech Corp., Cerritos, CA; http:// www.maxcorp.com;info@maxcorp.com.
(No Indian partner.)

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Micro Express

Micro Express NP8000-P120, Micro Express NP8600-P120

If you need a high-powered notebook but don't have a large budget, look to Micro Express for good deals on two 120-MHz Pentium-based portables. The low-end value, 7.6-pound Micro Express NP8000-P120 costs $2,598 (direct) and has a 10.4-inch dual-scan VGA screen, a 4X CD-ROM drive, and a 778MB hard disk; Micro Express intends it for both business and home users. The 9-pound Micro Express NP8600-P120 costs $2,999 (direct) and has a 10.4-inch active-matrix screen, a fixed 4X CD-ROM drive, a floppy disk drive, and a 1.3GB hard disk; it is a presentation-class system meant as a desktop replacement. Both systems were competitive performers on our tests.

The NP8000, manufactured by Chaplet Systems USA, is similar to the Olivetti Echos P100D (reviewed elsewhere in this roundup). The NP8000 fared well in testing in the 120-MHz group, with average scores across our benchmark tests. The unit's nickel hydride battery powered it for 1:12 on the BatteryMark test. For extended use, you can install a second battery in the system's modular port. (This port can also house either the floppy disk drive or the CD-ROM drive; the floppy disk drive can also be used externally.) The unit is available without the CD-ROM module for $2,299.

The NP8600 is similar to the BSI NP8662T and the DTK DTN-5P120C units (also reviewed in this roundup) and is manufactured by NTC. The NP8600 posted average scores on most tests but garnered below-average results on both CPUmark tests. On our BatteryMark test, this notebook lasted for 1:20.

The Micro Express notebooks both use UMC chip sets, 256K synchronous L2 cache, standard DRAM, and sound chips capable of FM and wavetable synthesis. —*BB*

Micro Express NP8000-P120. Direct price: $2,598. **Micro Express NP8600-P120.** Direct price: $2,999. Micro Express, Irvine, CA;http://www.wpages.com/microexpress.
(No Indian partner.)



Micro Express NP8600, NEC 4080H, Micron TransPort.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Micro Express NP8000-P120	Good	Fair
Micro Express NP8600-P120	Good	Good
Micron Millennia TransPort	Excellent	Excellent
NEC Versa 4000C	Good	Fair
NEC Versa 4080H	Good	Good

Micron Electronics Inc.

Millennia TransPort

PC MAGAZINE EDITORS' CHOICE

Packed with features and backed by a good warranty, the Editors' Choice–winning, presentation-class Millennia TransPort is a great candidate for those who want no compromises. Positioned as a high-end desktop replacement system, it makes a highly impressive first outing for Micron, which is well known in the desktop market but very new to portables. At $5,198 (direct price), the 133-MHz system comes with impressive components, including a 12.1-inch active-matrix SVGA Toshiba display, a Toshiba 1.2GB hard disk, a Sanyo 6X CD-ROM drive, and both NTSC and S-Video video-out ports.

Based on an Intel mobile Triton chip set, the 8.2-pound (travel weight) system has 256K of pipelined-burst L2 cache and EDO DRAM. These components helped it earn above-average scores on both Winstone, both CPUmark, and our Disk WinMark 96 tests. Its CD-ROM WinMark 96 score was well above average. Its Graphics WinMark 96 score was average. The unit's lithium ion battery helped it last 2:41 on our BatteryMark test.

Micron also bundles Microsoft Office 95 Pro with the TransPort. The unit's standard floppy disk drive and CD-ROM drive are swappable, and you can replace them with a second battery ($199) or 1.2GB hard disk. A $299 Micron Dock Multimedia Port Replicator has a full set of ports, an Ethernet adapter, a SCSI-2 port, and larger stereo speakers than on the notebook.—*BB*

Millennia TransPort. Direct price: $5,198. Micron Electronics Inc., Nampa, ID; http://www.mei.micron.com.
(No Indian partner.)

NEC Technologies Inc.

Versa 4000C, Versa 4080H

NEC's Versa line of notebooks features handsome styling and a full complement of components to please the demanding road warrior. Built for the mainstream corporate market, the Versa 4080H ($4,790 street price) is a presentation-class machine with a Pentium/120 CPU but mostly below-average performance. The high-end value, 75-MHz Versa 4000C performed poorly for its category, and its $4,490 street price is also more expensive than most Pentium/100 systems in this roundup. For those looking for more

SERVICE & RELIABILITY

NEC Technologies Inc.	
Reliability	Better than average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Average

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power, NEC offers the Versa 6000 series of notebooks (see "The Shape of Laptops to Come" for a discussion of their features). They are now available but were not ready in time for testing.

The two systems come with slightly different screens, 10.2 inches on the 4000C and 10.4 inches on the 4080H; both produce brilliant pictures at SVGA resolution. NEC has positioned the stereo speakers well on each unit, at the top corners of the display panel, and the wrist rest contains a touch pad.

The NEC Versa units feature brilliant active-matrix screens with 800-by-600 resolution, as well as IrDA infrared ports.

Each unit's internal floppy disk drive is easily removable, and you can replace it with a 4X CD-ROM drive, with an additional hard disk, or with a second battery.

The 4080H comes with a 1GB hard disk; the 4000C's is 776MB. The Versa systems include two Type II PC Card slots, usable as one Type III slot, and a 28.8/14.4-Kbps PC Card fax modem. Other features include VGA, parallel, and serial ports; a PS/2-style keyboard/mouse connector; and IrDA-compliant 115.2-Kbps infrared I/O.

Both Versa systems use lithium ion battery packs. On our BatteryMark tests, these packs yielded 2:19 of life for the 4080H (7.4-pound travel weight) and 2:07 for the 4000C (7.7-pound travel weight). Other test results were not as good: The 4000C had below-average results across the board for its category, and the 4080H had below-average scores on our Winstone and CPUmark tests as well as on the CD-ROM WinMark 96 tests. The 4080H's other scores were average.—*CL*

Versa 4000C. Street price: $4,490. **Versa 4080H.** Street price: $4,790. NEC Technologies Inc., Mountain View, CA; http://www.nec.com; techsupport @nec tech.com.
(Indian partners, Byte systems, Calcutta, Mahindra Electronics, New Delhi.)

Olivetti Personal Computers

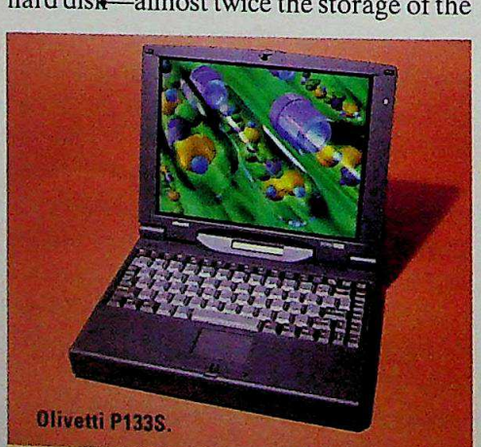
Echos P100D, Echos P133S

Olivetti Personal Computers' high-end value, 133-MHz Echos P133S ($4,999 street), meant for mobile professionals, and the low-end value, 100-MHz Echos P100D ($2,499 street), marketed as an entry-level machine, each combine rugged design and good features. But although the P133S performed well, the P100D could not keep up with its competition. We were disappointed with both units' tested battery life: The P100D lasted 1:21 and the P133S 1:11. (Both use nickel hydride batteries.)

Since our tests, Olivetti has upgraded the P100D, which is no longer available; its replacement (with the same price) is the P100C, which has an 11.3-inch screen, a 6X CD-ROM drive, and a 1.3GB hard disk. The Echos line marks Olivetti's reentry into the U.S. PC market; Echos have been available in Europe since August 1995.

The P100D is similar to the Micro Express NP8000-P120 (also in this roundup); Chaplet Systems USA builds both.

The 7.9-pound P133S comes with an 11.8-inch TFT screen, and the 7.5-pound P100D uses a 10.4-inch DSTN screen; both are SVGA displays. The P133S also includes 256K of L2 cache and a 1.3GB hard disk—almost twice the storage of the



Olivetti P133S.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Olivetti Echos P100D	Fair	Fair
Olivetti Echos P133S	Good	Good

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P100D's 776MB disk. Both Echos have a touch pad, stereo speakers, and 115.2-Kbps infrared ports.

The Echos feature internal floppy disk drives that can double as external drives when you attach a cable to the parallel port. The machines also have one modular bay, which can house a second battery or a 4X CD-ROM drive. (Olivetti did not send a CD-ROM drive with the P100D.)

The P133S performed well, with an above-average Graphics WinMark 96 score and average scores on other tests. The P100D performed poorly: It posted below-average scores across all of our benchmark tests.—*CL*

Echos P133S. Street price: $4,999. **Echos P100D.** Street price: $2,499. Olivetti Personal Computers, Austin, TX; http://www.olivetti.com.
(Indian partner Modi-Olivetti, Punj Lloyd House, 17-18 Nehru Place, New Delhi 110 019. Tel : 6427811; Fax : 466307.)

Polywell Computers Inc.

Poly 500NB5

While Polywell Computers' $3,300 (street) 133-MHz Poly 500NB5 is heavy on multimedia and game features, it was a poor performer on most of our benchmark tests. Polywell markets the system as a high-end value unit for frequent multimedia software users. The 500NB5 is similar to Broadax Systems' NP5265A and Chem USA's ChemBook 5400 TFT, 150-MHz units (both reviewed elsewhere in this issue). Polywell also markets the Poly 500NS, its top-of-the line laptop.

The 9-pound (travel weight) 500 NB5 comes with a 10.4-inch TFT screen controlled by a Cirrus Logic 7543 chip set with 2MB of VRAM. The unit's 1GB Hitachi hard disk and its floppy disk drive slide out easily. (You can replace the latter with a second battery.) The 500NB5 also has a 4X CD-ROM drive, 16-bit audio, two speakers, and a microphone.

The unit offers a 28.8/14.4-Kbps PC Card fax modem, an IrDA-compliant infrared port, an expansion port for a mini–docking station, and rear contacts for a $250 external battery pack. For gaming away from home, the 500NB5's palm rest offers a joystick rocker button, four joystick buttons, a touch pad, and a game/MIDI port.

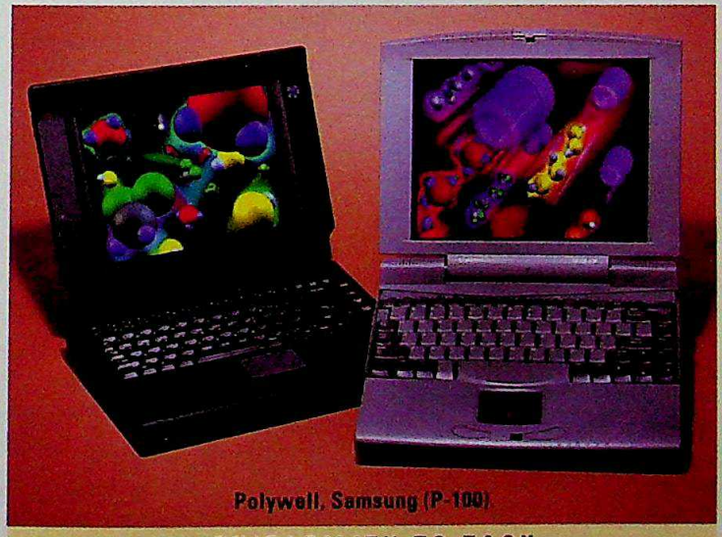
The 500NB5 logged some of the lowest scores in its class on our Winstone tests. Except for an average CD-ROM WinMark 96 score, other test results were all below average. On our BatteryMark test the system, which uses a nickel hydride battery, lasted 1:01.—*RSA*

Poly 500NB5. Street price: $3,300. Polywell Computers Inc., South San Francisco, CA; http://www.polywell.com.
(No Indian partner.)

Samsung Electronics America

SENS 810 (P-100), SENS 810 (P-133)

Samsung Electronics America's SENS 810 notebooks are represented here in two categories. The 100-MHz SENS 810 (P-100), a low-end value unit with a 773MB hard disk, a 4X CD-ROM drive, and an 11.4-inch dual-scan SVGA display



Polywell, Samsung (P-100)

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Polywell Poly 500NB5	Fair	Fair
Samsung SENS 810 (P-100)	Good	Good
Samsung SENS 810 (P-133)	Excellent	Good

ATTENTION READERS

PC Magazine has the highest readership among computer professionals.

According to the Simmons Compro III study conducted by New York-based Simmons Market Research Bureau (SMRB), one of the largest independent research companies in the US, ***PC Magazine*** is read and relied on by more computer professionals than even traditional IS publications designed specifically to appeal to this segment.

35.1% of this target group read ***PC Magazine.***

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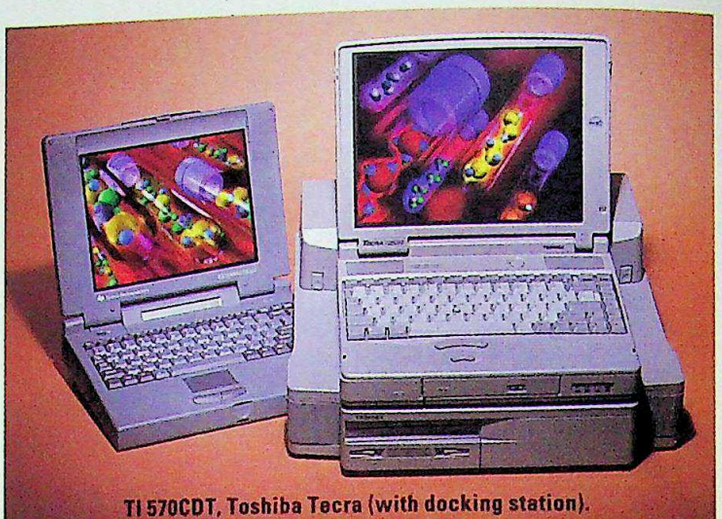
($3,667 street), is a bit pricey for a business system without a TFT screen but is otherwise appealing. The $4,499 (street) 133-MHz SENS 810 (P-133), a presentation system, comes with a 1.3GB hard disk, an 11.4-inch TFT display, and wavetable sound and offers a better balance of features and price. Both performed fairly well, although our technicians were not impressed by the build quality of either unit.

Each unit's keyboard can split apart and swing to the sides for more comfortable use, much like Microsoft's ergonomic desktop-PC keyboard. The systems (both 9.6 pounds, travel weight) have Samsung motherboards with Intel chip sets, 256K of pipelined-burst cache, and EDO DRAM. Both also have internal 28.8/14.4-Kbps modems and nickel hydride batteries.

The P-100 posted above-average scores on our Winstone 32, CPUmark, and Disk and CD-ROM WinMark 96 tests; its Winstone 96 score was average for its class. Only the Graphics WinMark 96 score was below average, because of the Cirrus Logic CL-GD7543 graphics chip set with 1MB VRAM. Life away from AC is limited: The unit had a 1:27 BatteryMark result.

The P-133 scored above average on the Winstone 32 and CD-ROM WinMark tests and had the highest CPUmark results in this roundup. The unit's Winstone 96 score was average, but like the P-100, which has the same chip set, the P-133's Graphics WinMark 96 score was below average. Its Disk WinMark score was also below average. Its tested battery life was 2:47. *—BB*

SENS 810 (P-100). Street price: $3,667. **SENS 810 (P-133).** Street price: $4,499. Samsung Electronics America, Ridgefield Park, NJ; http://www.sosimple.com.
(Indian partners DCM-DS, Reasonable Computers, New Delhi.)



TI 570CDT, Toshiba Tecra (with docking station).

SUITABILITY TO TASK

	Desktop replacement	Road warrior
TI Extensa 515	Poor	Fair
TI Extensa 570CDT	Good	Good
Toshiba Satellite Pro 420CDT	Excellent	Excellent
Toshiba Tecra 720CDT	Excellent	Good

Texas Instruments Inc.

Extensa 515, Extensa 570CDT

Texas Instruments' Extensa notebooks offer good looks and functionality for small-office or home-office users. The 8.5-pound TI Extensa 570CDT ($3,999 street) is a Pentium/100-based machine with a 10.4-inch active-matrix screen, 4X CD-ROM drive (6X is now standard), and average performance, making it a good high-end value system. At $2,299 (street), the 6.6-pound, 100-MHz TI Extensa 515 is a compact low-end value system with a 10.4-inch dual-scan VGA display. Although the 515 should get the job done, its performance was below average for its class; the 570CDT was an average performer on all benchmark tests. The 515 is similar to the Acer Note Lite, reviewed elsewhere in this roundup. TI also sells the TravelMate series of high-end notebooks (not reviewed here).

SERVICE & RELIABILITY
Texas Instruments Inc.

Reliability	Average
Repair	Average
Technical support	Average
Percent needing repair	Worse than average

The Extensa systems share some features, such as two Type II PC Card slots, 28.8-Kbps PC Card modems, and external VGA, parallel, serial, and PS/2-style connectors. Both have nickel hydride batteries; the 515 scored 2:49 on our BatteryMark test; the 570CDT, 2:09.

The 570CDT includes 256K of synchronous SRAM and a 1GB hard disk. The 515 has no external cache and has a smaller 774MB hard disk. The 570-CDT also has a drive bay that can house a floppy disk drive, CD-ROM drive, or second battery. The 515 offers an internal floppy disk drive and an easy-to-remove keyboard, affording ready access to the unit's internal components.

The lack of cache affected the 515's performance, making its test scores some of the lowest in its category; none were average. The 570 CDT was an average performer on our benchmark tests for its class.—*CL*

TI Extensa 570CDT. Street price: $3,999. **TI Extensa 515.** Street price: $2,299. Texas Instruments Inc., Dallas, TX; http://www.ti.com.
(Indian partner NEXCEL Electronics, Presidency Center, Maker Bhavan No. 2, 18 New Marine Line, Bombay 400 020. Tel : 2873523; Fax: 2084477.)

Toshiba America Information Systems

Tecra 720CDT, Satellite Pro 420CDT

The 133-MHz presentation-class Tecra 720CDT ($6,299 street) and the 100-MHz high-end value Satellite Pro 420CDT ($4,198 street) from Toshiba America Information Systems prove that the features gap between a high-end notebook and a budget-priced workhorse doesn't have to be wide. With 6X CD-ROM drives and strong performance, both units are solid choices for travelers. Toshiba aims its Satellites at demanding but budget-conscious users, while the multimedia-equipped Tecras are meant as desktop replacements. Toshiba also offers the Portégé line of lightweight notebooks.

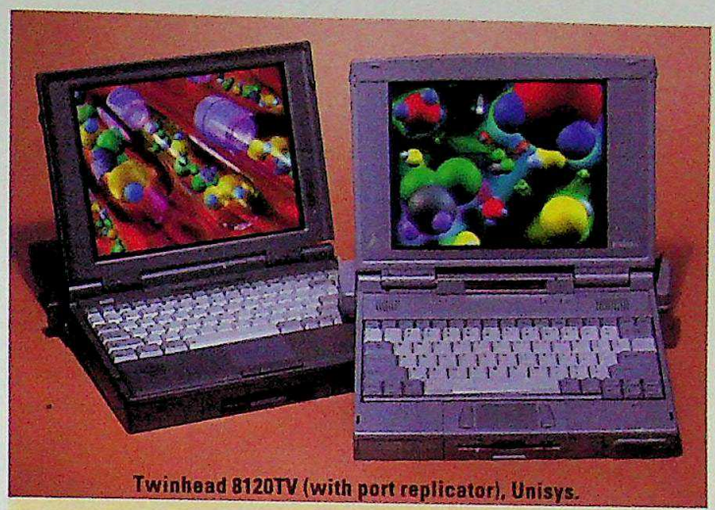
SERVICE & RELIABILITY
Toshiba America Information Systems

Reliability	Better than average
Repair	Better than average
Technical support	Better than average
Percent needing repair	Better than average

Both units' CD-ROM and floppy disk drive modules are interchangeable; you can also insert the floppy disk drive into a slim case for use as an external drive. Each also offers an IrDA infrared port

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Twinhead 8120TV (with port replicator), Unisys.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Twinhead Slimnote 875CX	Fair	Fair
Twinhead Slimnote 8100TX	Good	Fair
Twinhead Slimnote 8120TV	Good	Good
Unisys Aquanta MN	Good	Good

nd integrated 16-bit audio; the Satellite ro has one speaker, while the Tecra of- rs two. Both support the new Zoomed ideo port (ZV Port) standard, which im- roves video performance by allowing ideo data to bypass the system bus.

A convenient feature in the 8.6-pound ravel weight) Satellite Pro is its built-in C adapter. Our test unit had a 776MB ard disk; by the time you read this, the ystem is set to have a 1.3GB disk for the me price. Its 11.3-inch active-matrix dis- lay offers SVGA resolution.

The Tecra (10.3-pound travel weight) is ruly a high-technology showcase. Its 12.1- nch TFT display is the only one in this roundup with a resolution of 1,024-by-768. ystem memory can be upgraded to 44MB, far more than any other tested sys- em. The unit came with a built-in 28.8/14.4- Kbps voice modem and a 1.3GB hard disk. docking station ($949) is also available.

Both units use Chips and Technologies' ew 65550 64-bit graphics chip set with MB of EDO DRAM, which helped gar- er an above-average Graphics WinMark 6 score for the Tecra and an average score or the Satellite Pro. Each earned above- verage CD-ROM WinMark 96 results, nd the Tecra also had above-average PUmark scores. All other test scores were verage for each machine. The Satellite Pro nd the Tecra, each using a lithium ion bat- ery, also fared well on our BatteryMark est, lasting 3:28 and 2:42, respectively. —*RSA*

atellite Pro 420CDT. Street price: $4,198. **ecra 720CDT.** Street price: $6,299. Toshiba merica Information Systems, Irvine, A; http:// computers.toshiba.com.

ndian partners CMS, Bombay; HCL- A, New Delhi; Tangerine Infomatique, ombay; Teknotron Information, New elhi.)

winhead Corp.

Slimnote 875CX, Slimnote 8100TX, Slimnote 8120TV

Twinhead's three Slimnote entries—the 8120TV, the 8100TX, and the 875CX—are packed with high-end eatures: All are equipped with CD- OM drives, swappable components—cluding an upgradable processor mod- e—and NTSC/PAL video output, allowing business travelers to give presentations on a TV. The 8120TV and the 8100TX also boast good performance; the 875CX did not perform as well. Designed for users who need a presentation machine, the $4,195 (street), 120-MHz 8120TV showcases an 11.3-inch SVGA active-matrix display. The 100-MHz high-end value 8100TX ($3,775 street) has a more modest 10.4-inch SVGA active-matrix display for the general business user, and the $2,965 low-end value 75-MHz Slimnote 875CX has a 10.4-inch SVGA dual-scan screen.

The three systems share a basic design also found on the ARMNote TS80CD-133TX and the DFI 7200TC (both reviewed elsewhere in this roundup).

The Slimnotes' cases pack a lot of features. All three come with 256K of synchronous cache, Cirrus Logic CL-GD7543 graphics chip sets, and a Megahertz 28.8/14.4-Kbps PC Card fax modem. 16-bit stereo sound is provided by embedded speakers on the wrist rest. Also embedded on the wrist rest is a very responsive Synaptics touch pad. The modular bay can support either a floppy disk drive, 4X CD-ROM drive (6X will be standard by the time you read this) or a second battery.

Both the 8.2-pound 8100TX and the 8.1-pound 8120TV (travel weights) were average performers within their categories across our tests. The 8.3-pound 875CX did not fare as well: It had below-average results on all of our tests. The systems' lithium ion batteries produced timings of 1:37, 1:49, and 1:47 for the 8120TV, 8100TX, and 875CX, respectively, on our BatteryMark test.

The Slimnotes come with a standard set of ports, including external VGA and IrDA 115-Kbps infrared I/O. Also included are ports for microphone in and audio line out, as well as a connector for a game or MIDI device. A port replicator, available for $199, adds a second serial port and another PS/2 port. —*CL*

Slimnote 8120TV. Street price: $4,195. **Slimnote 8100TX.** Street price: $3,775. **Slimnote 875CX.** Street price: $2,965. Twinhead Corp., Milpitas, CA; http://www .twinhead.com.

(No Indian partner.)

Unisys Personal Computer Division

Aquanta MN

The super-modular $4,694 Aquanta MN from Unisys Personal Computer Division has all the components necessary to make an acceptable desktop replacement. Unfortunately, the piece that gets lost in the shuffle is performance: This 120-MHz Pentium unit lagged behind most of the other high-end value systems on our tests. The Aquanta MN is part of Unisys's new Aquanta series of customized servers, desktops, and notebooks.

The Aquanta notebook's key asset is its modularity: All front components can be removed. Two bays that can house an internal AC adapter, a nickel hydride battery, a floppy disk drive, or a second battery. Also available is a lithium ion battery specifically for use with the 4X CD-ROM drive module (they lock together).

The unit features a 10.5-inch TFT display, 1.1GB removable hard disk, 16-bit audio, two speakers, an integrated micro-

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phone, and a touch pad. It also came with a 28.8/14.4-Kbps PC Card fax modem. Rear ports include the standard I/O connectors, an IrDA infrared port, and an expansion connector for an additional $107.

The unit did not perform well on our tests. Its Winstone and Graphics WinMark 96 scores were below average for its class. Its Disk and CD-ROM WinMark 96 scores were average. When tested with the lithium ion battery and the CD-ROM module, the system lasted 1:00 on our BatteryMark test.—*RSA*

Aquanta MN. List price: $4,694. Unisys Personal Computer Division, San Jose, CA; http://www.pc.unisys.com.
(Indian partner Tata Unisys, Manish Commercial Center, 216A Annie Besant Road, Worli, Bombay. Tel: 4933560.)

WinBook Corp.

WinBook FX, WinBook XP5 P100, WinBook XP5 P120

PC MAGAZINE EDITORS' CHOICE

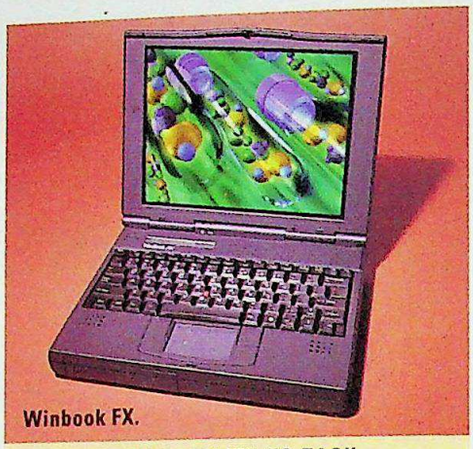
WinBook combines high-end components and solid performance with reasonable prices in its three notebook entries. We received the $4,079 WinBook FX, a full-featured presentation unit; the $3,679 high-end value WinBook XP5 P120, aimed at corporate users who don't need presentation capabilities, and the Editors' Choice $2,599 low-end value WinBook XP5 P100, geared to business users who don't need the power of the P120 model. (All prices are direct.) Using a lithium ion battery, each performed well on our BatteryMark test.

The FX, manufactured by Quanta Computer, is also being offered by Austin as the $4,171 Austin Edge CD and by AST as the $4,499 Ascentia P50.

Assisted by EDO DRAM, 256K pipelined-burst cache, and a Cirrus Logic CL-GD7543 graphics chip set, the FX posted average scores on our Winstone tests, as well as on the CD-ROM and Graphics WinMark 96 tests. Its 1.2GB Toshiba hard disk contributed to a below-average score on our Disk WinMark 96 tests. However, the FX lasted for an impressive 3:46 on our BatteryMark test.

SERVICE & RELIABILITY

WinBook Corp.	
Reliability	Average
Repair	Average
Technical support	Average
Percent needing repair	Average



Winbook FX.

SUITABILITY TO TASK

	Desktop replacement	Road warrior
Winbook FX	Good	Good
Winbook XP5 P100	Fair	Good
Winbook XP5 P120	Good	Good

The FX features an 11.3-inch active-matrix screen (12.1-inch screens are also available) and has an 8.3-pound travel weight. Its 4X TEAC CD-ROM drive can be replaced by a standard floppy disk drive or a second battery. By the time you read this, an internal 28.8-Kbps modem is set to replace the PC Card modem we received.

The XP5s were among the lightest in this roundup: The XP5 P120 weighed in at 6.7 pounds for travel, and the XP5 P100 just slightly more at 7.1 pounds. The XP5 P120 has the larger Toshiba 1.3GB hard disk, a Chips and Technologies 65548 graphics chip set, and an 11.4-inch TFT screen. The XP5 P100 has a 10.4-inch DSTN screen, a Toshiba 776MB hard disk, and a C&T 65535 graphics chip set. Both XP5s include a 14.4-Kbps internal modem but no CD-ROM drive.

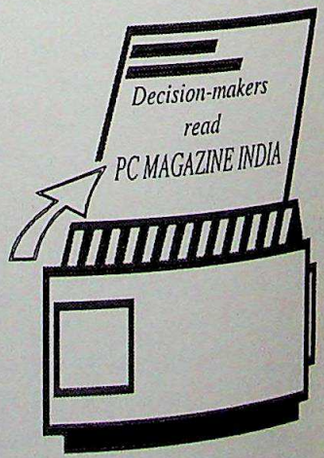
Both did well on our tests, earning average scores across the board. The XP5 P100 stood out, lasting an impressive 3:52 on our BatteryMark test, one of the longest times of any system in its class. The XP5 P120 lasted 2:50 on our BatteryMark test. The XP5s have an optional ($399) docking station with a 6X CD-ROM drive; the FX has a $99 port replicator. —*FJE* □

WinBook FX. Direct price: $4,079. **WinBook XP5 P120.** Direct price: $3,679. **WinBook XP5 P100.** Direct price: $2,599. WinBook Corp., Columbus, OH; http://www.winbook-corp.com.
(No Indian partner.)

You may be a scientist, academician, doctor, engineer, chartered accountant, or a corporate management executive.

You may be a student of computer science, a fashion designer interested in exotic shapes and colors, a successful individual using applications to enhance your productivity, or a complete novice.

In short, whatever your area of specialization or work, if success and profit matter to you, read about the latest developments in the world of PCs in *PC Magazine India.*



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BILL HOWARD

New SOHO Solutions

Back in high school, my yearbook advisor gave me a warning: I was spending altogether too much time building Heathkits, taking and developing pictures, and tinkering with cars—and not enough on academics and the school publications. If I wanted to get ahead in journalism, he advised me, it was time to shape up. "After all," he said, "What are the chances somebody's going to pay you good money to fool around with electronics when you're an adult?" Hmm...well, years later, I'm still fooling around with electronics. Here's a rundown of the handful of recent products I've seen, tinkered with, and liked.



GREAT GADGETS

Here's a rundown of the handful of recent products I've seen, tinkered with, and liked.

SoloCall, a paperback-size gray box, provides call management for four devices—typically a two-line telephone, a modem, a fax machine, and an answering machine—connected to two phone lines. Think of it as a one-room PBX. The $495 (list) SoloCall, from startup SoloPoint (*http://www.solopoint.com*), figures out which incoming calls go to which devices. SoloCall automatically switches your outbound modem or fax transmissions to the other line if the assigned line is in use. Important calls can be forwarded to another telephone off site (even a cellular phone) if no one answers; the same pass-code system lets priority calls ring through after hours. SoloCall has virtually every bell and whistle you could want: caller ID, distinctive-ring switching, fax recognition, three-way calling, call logging for client billing, voice mail monitoring, and the ability to customize answering options based on the time and day.

If you set up SoloCall using the defaults, you'll be up and running in a few minutes. I found the custom setup frustrating, however—the high-tech equivalent of assembling a kid's toy on Christmas Eve: "Insert slot A into tab B of bolt retainer clip (Fig. 14)." You can program SoloCall from your phone and run it as a standalone device, but it works best attached to your PC via the serial port. (This is another product that will benefit immensely from a Universal Serial Bus interface.) At $249 or even $299, I think SoloCall would be a smash hit on the order of Visioneer's PaperPort personal scanner.

Desk space is an issue for most home or small business offices, so a combination ink jet printer/fax machine makes a lot of sense. Until recently, however, none of these multifunction devices offered true, four-color ink jet printing. But we now have a successful fusion of the two technologies: the Canon MultiPass C2500 "document processing system"—a fancy way of saying a combination BJC-4100 four-color printer and easy-to-use fax machine. With a street price of $600, it's the about the same as—or even as much as a hundred dollars cheaper than—what you'd pay for a BJC-4100 and a separate entry-level, plain-paper fax. As a standalone fax machine, it's a reliable, idiotproof device with big buttons. You can send paperless faxes from your PC via the printer port, and it also has a 200-dot-per-inch convenience copier and black-and-white scanner. This would be a killer device with a higher-res color scanner and Visioneer PaperPort software (*http://www.ccsi.canon.com*). (Panasonic markets a similar device, the KX-F1600, for a list price of $750.)

Here's a simple solution to the problem of transformer bricks too bulky to plug side-by-side into standard power strips. American Power Conversion makes a heavy-duty, foot-long AC power-cable extender, intended for use with its PowerDirector switching unit but helpful with any device. Dealers are unlikely to carry it, so call APC directly (*http://www.apcc.com*) and ask for part number CAP 9506 ($4.95). APC also has a 250 volt-amp UPS, the BackUPS Office ($159 street price), that has two of its six out-lets spaced far enough apart to accommodate transformer bricks. One note of caution: It won't work with PCs that draw more power than a Pentium/133 would.

Music-loving, laptop-toting road warriors who spend a lot of time on airplanes will benefit from noise-canceling headphones from Sony. They do a fabulous job of knocking out the persistent drone of jet engines, so you arrive at your destination feeling less fatigued. The music quality is pretty good, too—as it should be for a device with a list price of $199.95. The headphones come in two models: The MDR-NC20 is a comfortable, folding-earmuff style, and the MDR-NC10 fits in the ear, doing a better job of sealing out noise. The headphones can run for 40 hours on a single AAA battery. Good luck getting your company to buy you a pair—although the peace and quiet are definitely worth it *http://www.sony.com*). □

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Why ZD's PC Benchmark Team, and Not PC WorldBench, sets the standard for the Industry

○ Winstone 32 and Winstone 96 provide a complete team that runs a total of 21 business applications. Winstone 32 includes eight 32-bit business applications from five different vendors. Winstone 96 includes 13 16-bit business applications from six different vendors.	○ PC WorldBench uses only three 16-bit applications and three 32-bit applications from a total of four different vendors. All three of the 32-applications PC WorldBench uses are from a single vendor (Microsoft).
○ ZD's PC Benchmarks CD-ROM which contains Winstone 32, Winstone 96, and WinBench 96 includes everything you need to run the benchmark programs, including the applications Winstone 96 runs during a test.	○ With PC WorldBench, you have to own or buy the necessary applications and install them yourself.
○ Winstone 32 produces an overall score for the PC regardless of the application software installed.	○ With PC WorldBench, if the test PC does not contain all the necessary applications, you can't get an overall score.
○ With Winstone 32 or Winstone 96, if you want more information on why a system performs as it does or if you notice an anomaly or a problem with a system. WinBench 96's subsystem tests can help you find the particular component causing the problem.	○ PC WorldBench provides only applications and overall scores for a PC: it does not provide any subsystem-level tests. Thus, you have no way to go more technical information on a systems performance or investigate problems its experiencing.
○ You don't have to do any special application setup to run Winstone 32. With both Winstone 32 and Winstone 96, the installation and setup programs do everything for you. So, you can count on accurate and repeatable results, because the applications Winstone 32 and Winstone 96 run will be set up the same way on each test system.	○ With PC WorldBench, you have no way of knowing how the *PC World* Test Center set up applications on its test systems for its reviews. Even if you have the necessary applications to run the program installed on the test system, you can't guarantee that the setup of these applications matches the *PC World* Test Center's setup. Thus, you won't be able to accurately compare your scores with scores *PC World* has published.
○ To determine which applications to use in both Winstone 32 and Winstone 96, ZD consulted with Computer Intelligence InfoCorp (CII), a leading market research company (and another division of ZD). We chose the business applications that were the market leaders and were available when our development on these benchmark programs began. For Winstone 32, we similarly determined the 32-bit business application market leaders.	○ In their press release and articles regarding PC WorldBench, *PC World* did not disclose how they chose the applications the benchmark program uses.
○ Multiple ZD publications around the world use the PC benchmark testing team to measure PC performance.	○ Only one publication, *PC World*, uses PC WorldBench.
○ ZD publications review hundreds of machines using Winstone 32 and other ZD PC benchmarks for their comparative reviews. *PC Magazine* alone reviewed 101 machines for their Spring COMDEX issue.	○ *PC World* reviewed 20 machines for their PC WorldBench debut issue in March.

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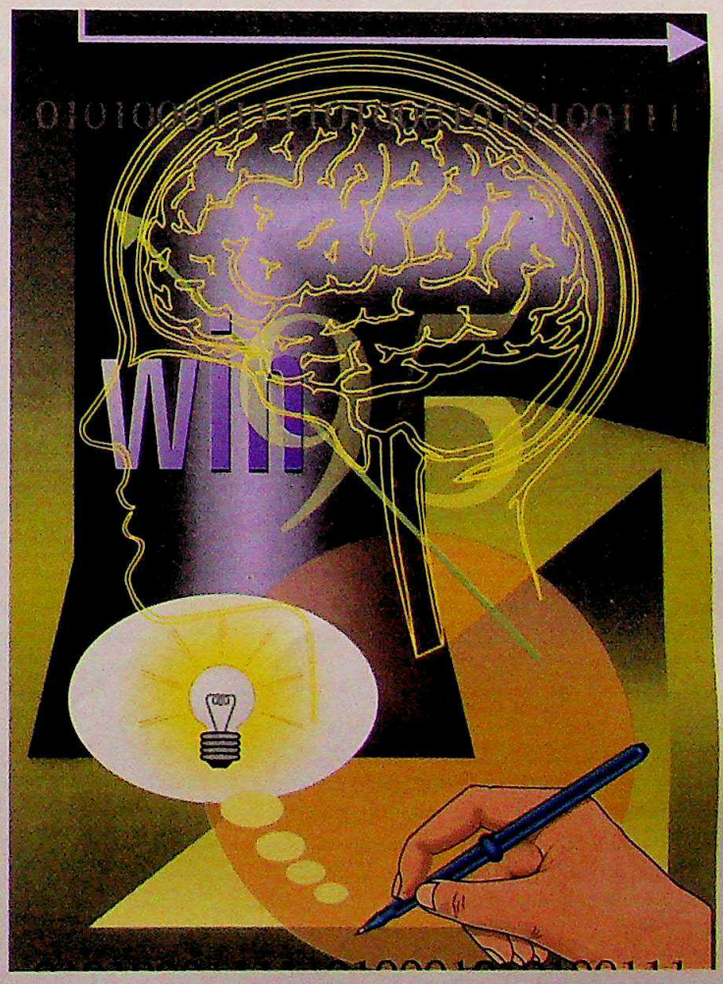
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Windows 95 Scripting Tools: Control Through Code

Seven scripting languages for automating and integrating Windows 95 applications.

By Barry Simon

As we go through the same clicks day after day, or manually move the same types of information from one application to another, we might well wonder: Did computers save us from one kind of drudgery just to replace it with another? Automation and application-integration tools like the seven Windows 95 products in this roundup offer a solution for putting these repetitive tasks on autopilot. Of the seven programs under review, four—Nombas's CEnvi, Quercus Systems' Personal REXX, Desiderata Software's PowerScript, and Wilson WindowWare's WinBatch—are conven- tional batch languages that produce ASCII scripts. They are normally run by giving a script a language-specific extension and launching it with double clicks or through Windows 95 shortcuts. Two of the products—Softblox's SmartPad and SmartDesk's Virtual Desk—are more macro delivery schemes than scripting languages. Some users will just exploit these two products' ability to send keystrokes or menu commands to applications and never write a line of code, although



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both have full scripting syntax. The last product, Oberon's Prospero, is a visual scripting tool in which program flow is defined by dragging lines between objects on-screen rather than by writing code.

Of course, automation should ideally be provided by the operating system, but if anything, this function seems to be on the decline. DOS has had a batch language since Version 2.0, but Windows has never included a built-in language. Windows 3.*x* had a keyboard macro recorder, but it was dropped in the transition to Windows 95. (An exception to this trend is the new functionality in Windows 95's DOS batch language—most notably, its ability to start Windows applications.) OLE 2.0 protocols allow impressive communication between applications designed to use them, but OLE also demands scripting capability to automate its power.

OUR EVALUATION

In evaluating automation tools, we found that any one of a number of features could be critical for its overall usefulness. Initially, we looked at the flexibility of the underlying scripting language in terms of variables and control structures. Here, we encountered a wide variation, from elegant C-like languages to quick-and-dirty coding syntax. A clever coder can generally find workarounds for almost anything, but you want to be able to use the standard constructs of a structured language. In particular, we found that true arrays are not widely supported.

We also looked at how each product lets you control Windows applications, integrate them, and pass data between them. Sending keystrokes and low-level mouse actions can be useful, but calling menus directly is more robust. OLE automation, supported by four of the seven products, makes it possible to pass rich data objects between applications with relative ease.

All of the tools provide coding systems, but only two let us generate code based on recorded actions—useful for quick-and-dirty work and for roughing out skeleton scripts. Surprisingly, many of the products also lack a dialog-box editor, making it more difficult to build interface elements for capturing user input. Some of the languages provide encapsulations of the Windows common dialogs. We found that debugging facilities range from nonexistent to fully adequate modules that provide breakpoints, trace, and watch variables.

- **SmartPad Pro, SmartPad Desktop**
- **WinBatch, WinBatch+Compiler**

Of the seven automation tools we reviewed, two really stand out: Softblox's SmartPad and Wilson WindowWare's WinBatch. SmartPad, Version 3.5, gives both novices and experts the ability to make useful button pads that launch automation scripts. Experts will want SmartPad Pro in order to use the powerful scripting language, integrated development environment (IDE), and debugging facilities. End users can use SmartPad Desktop to run scripts created in the Pro version or to create button pads to automate basic tasks.

PC MAGAZINE EDITORS' CHOICE

As a straight batch language, WinBatch comes out on top. Its syntax is especially well adapted for providing rich Windows functionality. It also gives you a dialog-box editor, a macro recorder, and many script-launching mechanisms. The WinBatch+Compiler lets you compile and distribute your applications royalty-free.

Oberon's Prospero earns an honorable mention for bringing a powerful visual metaphor to automation programming. Working with Prospero's application-specific building blocks can be far easier than writing comparable OLE automation code, but it is likely to be less attractive to those with extensive programming experience.

Nombas

CEnvi

ALL REVIEWS BY BARRY SIMON

Nombas's shareware scripting program for 32-bit Windows, CEnvi 2.11 ($69), is an interpreter for the company's proprietary language, Cmm (C minus minus), a simplified dialect of C. In Cmm, variables are not explicitly typed or predeclared, and there are no pointers. There are also no explicitly defined structures, although you can set up on-the-fly structures much as you can in REXX.

The result is an interpreted batch language with much of the power of C but some of the quick-and-dirty flavor of old-fashioned BASIC. It will obviously appeal to experienced C programmers; those without C experience may find it forbidding.

CEnvi supports most of the functions in the standard C library and adds to those with other useful built-in functions. It also provides libraries of additional functions with text-file function definitions that can be added with an #include directive. These libraries encapsulate a fair number of Windows API calls, giving the Cmm programmer quick access to services such as menu invocation in any running application. The libraries are useful, but they don't offer much in the way of error checking. Documentation is limited to comments in the individual .LIB files.

CEnvi is missing a number of features, including recording capability and a dialog-box editor. The current version lacks a debugger, although one will be included in Version 3.0, which is expected to be out by the time you read this. The only direct ways to run scripts are by double-clicking or using the Run command, although you can activate them through Windows 95 shortcut hotkeys. CEnvi versions exist for DOS, OS/2, Windows 3.1, and a variety of Unix flavors, and Nombas is developing Cmm as a scripting language for the Web. CEnvi scripts can be compiled to standalone .EXE files; you need a license from Nombas to distribute them. CEnvi is not devoid of rough edges; nevertheless, any C programmer looking for a Windows scripting tool will want to take a closer look.

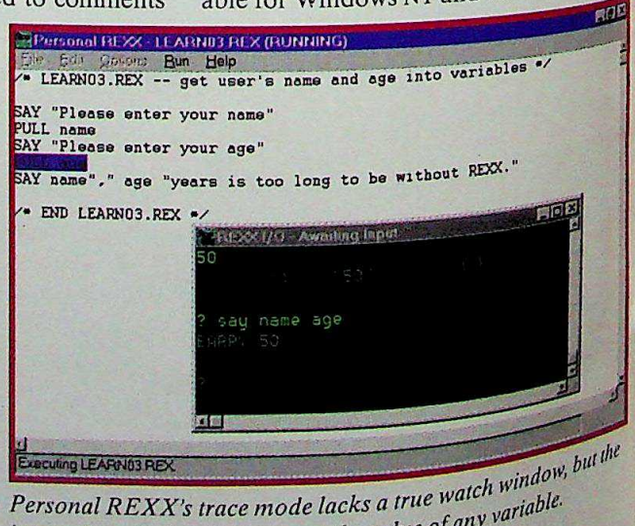
CEnvi 2.11. Shareware registration fee: $69. Nombas, Medford, MA; http://www.nombas.com.

(No Indian partner.)

Quercus Systems

Personal REXX for Windows

OS/2 users converting to Windows may well miss REXX, OS/2's native scripting language. Quercus Systems' Personal REXX for Windows, Version 3.5 ($175), available for Windows NT and Windows 3.1, can



Personal REXX's trace mode lacks a true watch window, but the interactive window lets you test the value of any variable.

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Digitized by Arya Samaj Foundation Chennai and eGangotri

fill that void. Quercus recommends running the 16-bit version under Windows 95 because of problems the company says stem from Windows 95 itself.

Personal REXX will also be an attractive possibility for those looking for a scripting language suited to pattern matching and manipulation of text, areas in which REXX shines. The language, with untyped variables and pointed variables (a highly flexible replacement for the arrays and records used by other languages), is a pleasure to use. A pointed variable such as `foo.1.2`, for example, could replace an array like `foo[1,2]`. But because REXX also lets you use `foo.name` and `foo.address`, you are able to deal with more general objects than is possible with standard arrays. Personal REXX performs variable substitution on anything after the period, so that `foo.i.j` will be interpreted as `foo.1.2` if `i=1` and `j=2`.

Debugging is straightforward, as Personal REXX supports the trace mechanism used by standard REXX. There is no watch window, but you can examine the value of any variable at the prompt displayed between program steps.

Personal REXX gives you access to a number of Windows-specific functions that let you send keystrokes or Windows messages to any program. But it offers less control over Windows and Windows applications than any other products in this roundup. You can set up simple dialogs that return a single yes/no choice or display a simple text-input box, but there is no mechanism for building complex input dialogs.

Both a runtime version and an interface for C programmers to call the REXX DLL are available. The company offers similar implementations of Personal REXX for DOS and, of course, OS/2.

Personal REXX for Windows 3.5. List price: $175. Quercus Systems, Saratoga, CA; http://www.quercus-sys.com.
(No Indian partner.)

WINDOWS AUTOMATION LANGUAGES AT A GLANCE

	CEnvi 2.11	Personal REXX 3.5	Power-Script 1.0	Prospero 1.0	SmartPad 3.5	Virtual Desk 2.0	WinBatch 96B
Language							
Arrays				✓	✓	✓	
Pointed or list variables	✓	✓	✓				✓
DDE	✓			✓	✓		✓
OLE automation	✓			✓	✓		✓
Development Tools							
Script editor or IDE		✓	✓	✓	✓	✓	
Record keystrokes or mouse clicks					✓		✓
Record menu choices					✓		
Dialog-box editor				✓	✓		✓
Debugging							
Trace		✓		✓	✓	✓	✓
Breakpoints				✓	✓	✓	✓
Watch window					✓	✓	
Script Launch Methods							
Via extension	✓	✓	✓	✓			✓
Button pad or clickable object					✓	✓	
Pop-up menu					✓	✓	✓
Drag-and-drop target			✓			✓	

Desiderata Software

PowerScript

Desiderata Software's PowerScript 1.0 ($80) is a shareware scripting tool for Windows 95 and Windows 3.1 that uses a proprietary language with a C-like syntax. As you might expect from a 1.0 release, PowerScript lacks several amenities, but it is intelligently designed and offers some powerful constructs that at a minimum bear close watching.

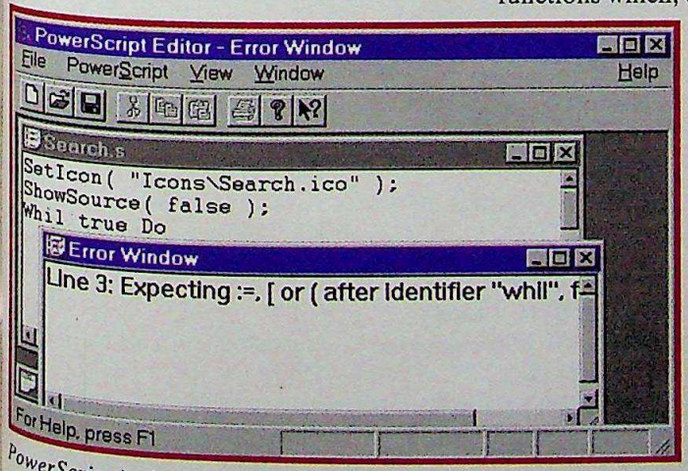
The language uses predeclared typed variables and offers most basic data types and control structures. It lacks a Case statement and arrays, but its string-manipulation and pattern-matching functions are strong enough that one could easily mimic the tab-delimited, arraylike objects found in WinBatch.

An intriguing feature of the language is what PowerScript calls *iterators*. These are functions which, used in a For loop, let the loop successively run through all instances that the iterator finds. For example, you could use the Files iterator in a loop beginning `For t in Files (C:\*\*.dll)` where `t` is a string variable that is successively defined to each DLL on disk. Other iterators are provided for lines in a text file and for lines in Clipboard text.

PowerScript won't let you create or display elaborate dialog boxes, but it does give you functions to get simple string input or input from a dialog containing a single group of radio buttons. There is no explicit debugging or single-stepping, but the package includes an editor that highlights the current line of a script as it runs.

One of the program's strengths is its ability to communicate directly with other programs. You can locate windows and dialogs and send them keystrokes, menu choices, or even Windows messages (there is no DDE or OLE automation support, however). Another powerful feature is the ability to iconize a script on the desktop, which can then become a drag-and-drop target capable of initiating scripting actions when a file or group of files is dragged onto it.

PowerScript 1.0. Shareware registration fee: $79.90. Desiderata Software, Chestnut Hill, MA; http:// www1.usa1.com/~desisoft.
(No Indian partner.)



PowerScript includes an IDE with syntax checking and error messages that help you debug scripts.

Oberon Software Inc.

Prospero

Oberon Software's Prospero, Version 1.0 ($695), takes a novel visual approach to application integration and automation. Working in a project-oriented development environment, you use a visual programming metaphor to build scripts from application objects by drawing links between them that define and expose your program logic. You begin your application by dragging program-specific building blocks from a palette to the Program Canvas. Blocks have visual inputs and outputs. For example, a Word Doc block has file bookmarks as inputs or outputs, and an Excel Doc block uses named ranges.

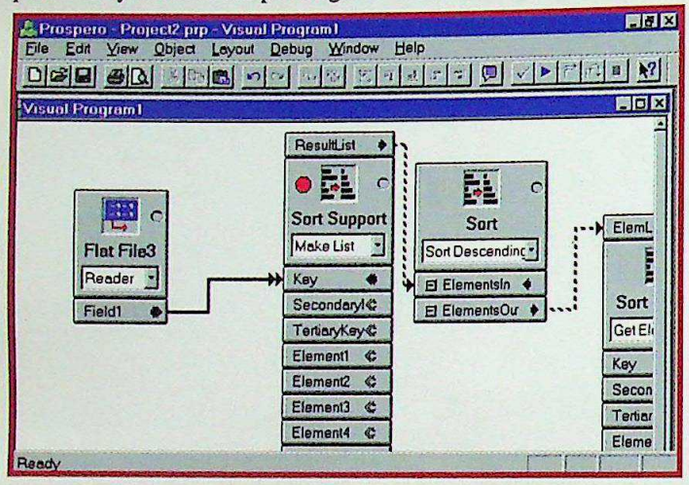
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LANGUAGE ELEMENTS

We've seen this basic paradigm in other tools (for example, in Prodea Synergy, which has since been relaunched as Platinum Technology's InfoSynergy), but Prospero vastly extends the paradigm with a rich set of language blocks that include If-Then-Else blocks and Loop blocks. Prospero also offers a Dialog Box block whose property sheet is a dialog editor. Links to this block include the contents of the block's text fields and drop-down lists. A Windows Common Dialog block lets you implement a standard Windows look and feel. A Function block takes inputs and performs one of a variety of supplied functions. Underneath some of the blocks is explicit code in a language that extends BASIC. There is even a block that lets you supply your own code in this language.

A debug mode is included, but it is awkward to turn on and off. Instead of setting a check mark on the program's Debug menu, you have to go to a dialog off of the File menu.



Prospero's visual programming metaphor makes the flow of data in your application clear.

PROGRAM BLOCKS

Since the purpose of Prospero is the automation of other programs, blocks that encapsulate other files and programs are crucial. Version 1.0 includes blocks for ACT!, Excel, Lotus Notes, Word, a general OLE server template, and a variety of data sources including Access, dBase, and SQL databases.

Announced for Version 1.1 (which we expect to be shipping by the time you read this) are blocks for Web pages, Microsoft Project, and a general OLE Automation template.

Prospero's approach often brings simplicity to otherwise complex tasks. It isn't terribly difficult to write the OLE automation code to transfer data from Access to Word, for example, but it is tedious and certainly forbidding for the novice. Not only does Prospero encapsulate most of these difficulties, but with the connections visible on screen, it makes it easier to catch errors.

On the other hand, Prospero can make the simple more complex. If you want to repeat something four times, in BASIC you'd write `for i=1 to 4` and in REXX, the elegant `do 4`. With Prospero, you need to drag in and link three icons: one to define and increment the variable, one to test the condition, and one to execute the loop.

Knowledgeable programmers may find the encapsulation in Prospero too much of a good thing. But for the novice or occasional programmer, or for the harried IS programmer who needs to crank out a large number of simple integrated applications using standard programs, Prospero is an attractive option.

Prospero 1.0. List price: $695. Oberon Sofware Inc., Cambridge, MA; http://www.oberon.com.
(No Indian partner.)

Softblox Inc.

SmartPad Pro, SmartPad Desktop

PC MAGAZINE EDITORS' CHOICE

Softblox's SmartPad, Version 3.5, comes in two variations: SmartPad Pro ($495), a powerful tool for creating integrated applications, and SmartPad Desktop ($89), a kit that allows end users to run those applications or to automate simple tasks. SmartPad Pro, which includes a full-fledged integrated development environment (IDE), proved to be the most powerful tool in this roundup.

SmartPad Pro lets you create scripts to assign to buttons in the Pro or Desktop versions. The language is a variant of BASIC, with arrays and standard control structures. Variables have types but, as in traditional GW-BASIC, need not be predeclared.

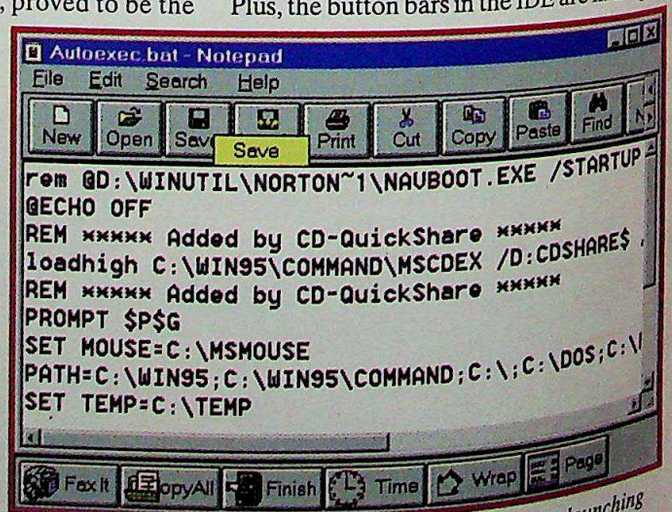
A wide variety of functions let you control Windows applications and communications between them. The scripts can be OLE Automation clients and can run any OLE automation server. SmartPad scripts can also issue DDE commands, and SmartPad itself can be controlled by other applications or by its own scripts via DDE. You can access the Clipboard, the menu commands of any application, and send keystrokes or mouse actions.

The Pro version's IDE provides a full debugger, including a watch window and interactive breakpoints. You can record macros, with keyboard and mouse actions translated into higher-level actions like menu choices. The Pro version also has a dialog-box editor; dialogs can be pasted back and forth between the code window and the dialog editor. You'll find evidence of a thoughtful design strategy throughout the product. For example, when you indicate that you want to assign a menu command, you can select the application with a mouse and have SmartPad capture the menu tree for you so that you can choose the menu item visually.

The end user triggers SmartPad actions with buttons on a SmartPad button palette. SmartPads are application-specific and can float or attach to any of the four sides of an application window. A button can have a hotkey assigned to it, and you can set autostart, auto-end, and agent scripts to be triggered by environment changes. There is no simple way to run a script via a Windows shortcut or Start Menu item, however.

Users without access to the Pro version can assign five types of actions to a button: run an application, send keystrokes or a menu command to an application, run a recorded keyboard or mouse macro, execute a DDE command, and switch SmartPads.

Although SmartPad is generally put together well, the port to Windows 95 shows a few rough edges. When you assign a script to a button, you do so in a dialog that supports long filenames. But if the path has spaces in it, the button won't call the script unless you enter the equivalent short filename by hand. Plus, the button bars in the IDE are in desper-



SmartPad lets you set up many types of button pads for launching scripts, as in this makeover of Windows Notepad.

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ZD PC Benchmark Enhances Lead over PC WorldBench

The latest addition to Ziff-Davis PC benchmark product testing team is Winstone 32. Winstone 32 is ZD's benchmark for measuring the overall performance of PCs running Windows-based 32-bit business applications. Winstone 32 will run on both the Windows 95 and Windows NT 3.51 (and higher) operating systems.

ZD's other PC benchmarks include:

Winstone 96, an application-based benchmark for measuring the overall performance of PCs running Windows-based 16-bit business applications.

WinBench 96, a subsystem-level benchmark that measures the performance of a PC graphics, disk, processor/RAM, full-motion video, and CD-ROM subsystems in a Windows environment.

These two benchmarks will run on either Windows 3.x or Windows 95.

As we all know, *PC World's* PC WorldBench was an attempt by that publication to create a contender to ZD's industry-standard Winstone 96 benchmark. PC WorldBench, however, falls far short of being a serious competitor to Winstone 96 alone, much less to the team of the three ZD PC benchmarks. Many critical differences between not only the benchmarks of the two companies, but also the development and testing methodologies the companies use, make clear the superiority of ZD's approach.

Lets start with something simple: How each company creates benchmarks. ZD does not gather developers and contractors for a short, one-time project to produce a benchmark program. Instead, ZD maintains a dedicated benchmark development organization, the Ziff-Davis Benchmark Operation (ZDBOp), that produces all of ZD's publicly available benchmark programs. ZDBOp's staff of nearly 40 people works year round, updating ZD's benchmark programs to keep pace with the latest technologies. In fact, the ZDBOp development teams are already hard at work preparing the next versions of Winstone and WinBench.

The differences between the approaches of the two companies are even more apparent when you look closely at their benchmarks. Where *PC World* offers one benchmark that uses just three 16-bit applications and three 32-bit applications, ZD offers a team of three different benchmark programs, each designed to measure specific aspects of a PC's performance. ZDs Winstone 32 includes eight leading 32-bit leading 32-bit apps, and Winstone 96 includes 13 leading 16-bit applications. In addition, PC WorldBench makes life hard for testers by requiring them to already own and have installed the six applications it uses. (This requirement also makes it difficult for any two testers to get the same results, because to do so they must have installed all the applications identically on every system they test.) Both Winstone 32 and Winstone 96, by contrast, contain everything you need to run the programs. All you need is the one ZD PC Benchmarks CD-ROM, and the full power of Winstone 32, Winstone 96, and WinBench 96 is in your hands!

The bottom line is simple: For the right approach in benchmark programs in particular and product testing in general, ZD sets the standards.

ZD has been testing products longer and better than anyone else in the business.

We were the first to conduct scientifically controlled labs-based testing of computer products at *PC Magazine* in 1984.

We were the first to create a centralized testing lab. ZD Labs is a facility that today remains the largest independent computer product testing lab in the world.

ZD devotes more resources to product testing and benchmark development than any other publisher. No other publisher makes this kind of commitment to product testing!

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Digitized by Arya Samaj Foundation Chennai and eGangotri

ate need of tool tips. Even so, SmartPad is the slickest package we reviewed.

SmartPad Pro 3.5. List price: $495. **SmartPad Desktop 3.5.** List price: $89. Softblox Inc., Atlanta, GA; http://www.softblox.com. *(No Indian partner.)*

SmartDesk Inc.

Virtual Desk

SmartDesk's Virtual Desk, Version 2.01 ($49.95), seems more like a way of life than an automation tool. With it, your desktop becomes a live environment in which you can place objects that react to a rich scripting language. But for conventional application integration, we found that slow performance and a few rough edges make Virtual Desk less than ideal.



Virtual Desk makes your desktop come alive with objects. The default Virtual Desk is shown here.

The program ships with numerous premade environments with links between them. Environments include Main Street, Office, Library, Message Board and Newsstand. Each comes with an appropriate bitmap for wallpaper, and those bitmaps have objects, such as a desktop calculator in the Office environment.

From each object's property sheet, you can assign scripts to a variety of actions including click, double-click, and drag-and-drop. The scripts can be accessed through buttons on the property sheets that open the script in the program's IDE.

Virtual Desk's IDE has a debugger that includes breakpoints and a watch window, but lacks some of the bells and whistles found in the SmartPad IDE. For example, while you can access Help for the language, you can't paste function templates directly into your code. Virtual Desk also lacks a dialog-box editor, but it does have a command-line interpreter, into which you can type scripting commands to see what they do.

The language syntax, with constructs like `for (i=1; i<=cnt; i++)`, is reminiscent of C, although the control structures and on-the-fly typing are more like BASIC. Some of the language's most intriguing commands manipulate Virtual Desk's objects. For example, you can build a script that concurrently creates a new object (say a note) and sets up the script that runs when you click on that object. Functions for manipulating files exist, but OLE automation, DDE, and controlling menus in other programs is not supported (although you can send keys and mouse actions to other programs). Virtual Desk even lets you automate your household appliances (!) via the X-10 protocol using a special device on your serial port and special receptacles in your electric outlets.

On our test system, which had 64MB of RAM, Virtual Desk in its default setup had a noticeable impact on performance. We also found rough edges in the documentation and Help system. Some of the Help choices in the IDE sent you to nonexistent topics, and the list of functions in the printed documentation and in the Help system didn't match. Virtual Desk's scripting language is well tailored for its own environment, but its limited ability to drive other applications make it less appealing as a general automation tool.

Virtual Desk 2.0. List price: $49.95. SmartDesk Inc., Laguna Hills, CA; http://www.virtualdesk.com. *(No Indian partner.)*

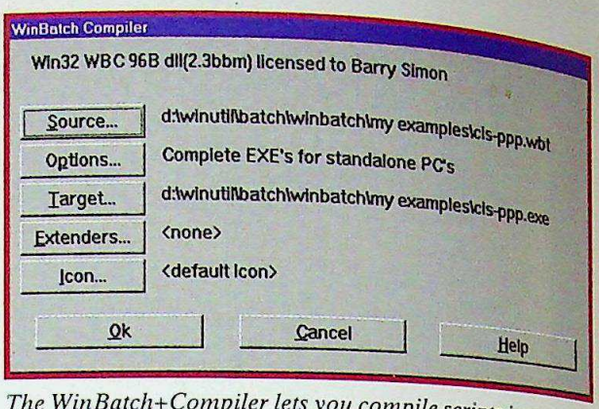
Wilson WindowWare Inc.

WinBatch, WinBatch+Compiler



WinBatch is the grandfather of Windows batch packages; its Windows Interface Language (WIL) was introduced at the same time as Windows 3.0. Today, the shareware WinBatch 96B ($99.95) is a powerful and sophisticated 32-bit scripting language available for Windows 95 and Windows NT. (Other supported platforms include Windows 3.1, and Windows NT on Alpha, Mips, and PowerPC.) The WinBatch+Compiler ($495) lets you compile WIL scripts into executables that can be freely distributed.

WIL the language has considerable power and flexibility but suffers from occasional inelegance. It lacks true arrays, dealing instead with tab-delimited strings (for example, the FileItemize function returns a tab-delimited string with the names of files meeting a given file specification). The ItemCount and ItemExtract functions are useful for manipulating such strings, although this approach is awkward for multi-dimensional arrays and will ultimately make a language purist wince. Still, it works in the context of scripts.



The WinBatch+Compiler lets you compile scripts into standalone executables that can be freely distributed.

WIL has a wealth of built-in functions for interacting with Windows applications, including the ability to send keystrokes and menu choices. Its only recording capability, however, is for keystrokes. WinBatch offers a bare-bones debug mode that lets you single step and get the value of any variable you type in but provides no formal watch window, no jumping over subroutines, and no formal conditional breakpoints. (You can simulate the breakpoints using code like `if j==2 then debug(@ON.)` A dialog-box editor is provided.

WinBatch scripts are text files with the extension .WBT; you can run them by double-clicking on the file icon. As long as the WinMacro program is active, you can also run scripts via hotkeys or from selections added to an application's system menu. You can add scripts to the context menu of files viewed in Explorer or located on the desktop, or you can define a menu of batch files to run from an icon in the notification area of the Windows 95 Taskbar.

The WinBatch+Compiler lets you make standalone .EXE files and distribute them to those who don't have WinBatch, making the WinBatch+Compiler an attractive and economical option for corporate IS departments. Overall, WinBatch is one of the most powerful automation tools for Windows 95 around. □

WinBatch 96B. Shareware registration fee: $99.95. **WinBatch+Compiler.** List price: $495. Wilson WindowWare Inc., Seattle, WA; http://www.windowware.com/. *(No Indian partner.)*

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PC Solutions

TIPS AND TECHNIQUES TO INCREASE YOUR PRODUCTIVITY

User-to-User

By Neil J. Rubenking

Fixing Windows 95's Audio CD Auto-play Feature

I recently downloaded the Power Toys utilities from Microsoft's Web site. I tried the FlexiCD utility, hoping to give myself more control over my CD player when listening to audio CDs. I didn't like the program, though, so I removed FlexiCD using the Add/Remove Programs applet in the Windows 95 control panel. The next time I inserted an audio CD into my drive, I discovered that the auto-play feature had disappeared. Microsoft doesn't offer technical support for Power Toys, so I had to fix the Registry for AudioCD myself.

If you've encountered the same problem, here's an easy way to fix it: Using Explorer, select Options from the View menu and click on the File Type tab. Select AudioCD, click on Edit, and click on Edit again in the Editing action dialog. Change the play action to "C:\Windows\Cdplayer.exe/play %1," then click on OK, Close, and Close.

I-FENG KAO, *Pullman, Washington*

PC MAGAZINE: Power Toys is a collection of cutting-edge Windows 95 enhancements created by the Windows 95 team but not supported by Microsoft. You can download Power Toys from its dedicated Web page, located at *http://www.microsoft.com/windows/software/powertoy.htm*. An earlier User-to-User column mentioned the TweakUI Power Toy, which lets you tweak the Windows 95 user interface. Other Power Toys include the FlexiCD utility mentioned here, a Taskbar icon for quickly changing video mode, a round clock, and several enhancements to Explorer.

When you insert an audio CD into the CD-ROM drive, FlexiCD appears as an icon in the taskbar notification area. Clicking on the icon pauses or resumes play, and its ToolTip window shows the length of the current track and the amount played. From the right-click menu, you can skip and select tracks, start, stop, eject CDs, and so on. Unfortunately, FlexiCD lacks a number of features present in the Windows 95 CDPlayer program. Most importantly, CDPlayer can store the CD name and track names for each CD and will retrieve the names automatically each subsequent time you insert a CD whose information it has stored. If you try FlexiCD and then uninstall it, you'll find that inserting an audio CD no longer auto-starts CDPlayer. That's when you'll need to apply this reader's tip.

Putting the FOR Command Through Its Paces

I have taken to using the FOR command to create one-line error-handling routines in batch files. My discovery that the colon (:) serves as a delimiter in some DOS commands, but not in the FOR command, made this possible. (For example, a colon separates the GOTO command and its label designation just as well as a space does.) In addition, some commands ignore extraneous characters on the command line; for example, everything after the label designation in a GOTO command is ignored. Thus, we have

```
for %%v in (echo goto:End) do %%v
➥Error message
```

The FOR command first echoes the error message and then executes the goto:End command. This approach replaces at least three lines: the test, a label, and the ECHO line.

It's also possible to extend this technique for other purposes. I often use it to create a tiny procedure that collects all of the command-line arguments into a single environment variable:

```
:Loop
if not '%1'=='' for %%v in (set shift
➥goto:Loop) do %%v
 V=%V% %1
```

Of course, this approach has a big overhead with regard to DOS command lines' 127-character limit. If that's a concern, the SET part can be placed between the Loop label and the IF test:

```
:Loop
SET V=%V% %1
if not '%1'=='' for %%v in (shift ➥goto:Loop)
do %%v
```

HIGHLIGHTS

HARDWARE If you have full-length expansion cards that won't fit in your new system, there is really only one thing you can do. *Page 97*

WORD PROCESSING Searching for and replacing codes in WordPerfect for Windows can be confusing. This quick review should help. *Page 98*

DATABASES The Fox Editor Enhancement Library for Visual FoxPro can do everything the missing Beautify feature could do—and much more. *Page 101*

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Neil J. Rubenking *is the technical editor and the author of* Delphi Programming for Dummies.

Luisa Simone *is a contributing editor and the author of* Microsoft Publisher by Design.

Craig Stinson *is a contributing editor and the coauthor of* Running Windows 3.1 *and* Running Microsoft Excel.

M. David Stone *is a contributing editor and the coauthor of* Word for Windows Companion, *Second Edition.*

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Extrapolating from this understanding leads to a simple test that will allow the user to input a filename with or without a specific extension such as .COM. Specifically, the file test can be something like the following:

```
for %%v in (%1.com* %1!@{?) do %0 )
➥%%v
```

If the filename is provided without an extension, "%1.com" will match a .COM file. If the extension is provided, "%1.com!@{?" will match. The string "!@{?" is an attempt to guard against matching an existing non-.COM file with the wildcard test. In either case, if a match is found, the FOR command will re-execute the original batch file with the correctly extended filename. The closing parenthesis as the first argument of the recursive call will cause the FOR to be skipped the second time through the routine. The filename becomes the second command-line parameter with this change.*

THOMAS LAVEDAS, *Clifton, Virginia*

PC MAGAZINE: Mr. Lavedas took the DIASM-.BAT example from the User-to-User column of April 9, 1996, and *seriously* enhanced it. The improved version does not rely on any external files, accepts filenames with or without the .COM extension, and can process all .COM files matching a template. It is also incredibly complex (Figure 1 shows DISASM3.BAT in all its cryptic glory. This column isn't big enough to explain all of the techniques used in this remarkable batch file, so we'll stick to the variations on the FOR command.

In the first example, the FOR command plugs the values "echo" and "goto:End" into the expression following DO, yielding the two commands:

```
echo Error message
goto:End Error message
```

The first command displays an error message, and the second jumps to the label End, disregarding the extra text following the label name.

The two-line technique for collecting all command-line parameters into a single environment variable requires a bit more explanation. Suppose you passed the strings "Heloise" and "Abelard" to a batch file using this technique. Assuming the environment variable V is initially empty, the first time around the FOR loop would execute three commands:

```
set V= Heloise
shift V= Heloise
goto:Loop V= Heloise
```

The extra text on the command line following the shift and goto commands is ignored. Shift moves all command-line parameters to the next-lower parameter, so the second time around the FOR loop will execute these commands:

```
set V= Heloise Abelard
shift V= Heloise Abelard
goto:Loop V= Heloise Abelard
```

All the parameters have now been shifted out, so the next time through the loop the first parameter will be empty, and the FOR command won't get executed. The variable V will contain all of the parameters in a single string.

The third example uses the FOR command's ability to replace a wildcard file specification with all files matching that specification. The batch-file line is:

```
for %%v in (%1.com* %1!@{?) do %0 ) ➥%%v
```

Suppose the user passes FOO.COM on the command line. When we replace the parameter symbols with their actual values, this line becomes:

```
for %v in (FOO.COM.com* FOO.COM!@{?) ➥do
DISASM3 ) %v
```

The first item in the FOR list doesn't match any files, because it's not a valid filename. The second matches FOO.COM, because the characters after the three-letter extension are ignored. So the batch file gets executed again, with a closing-parenthesis as its first parameter and FOO.COM as its second. Again replacing the parameter symbols with their actual values, we can see that the first line is now:

```
for %v in ()...
```

There's no need to complete the line. When the first %1 is replaced by a closing parenthesis, the FOR command's item list is empty, and the rest of the line is ignored by DOS.

What happens if the user passes FOO without the .COM extension?

```
for %v in (FOO.com* FOO!@{?) do
➥DISASM3 ) %v
```

The second item in the FOR command's list should not match any files, but the first matches FOO.COM. As before, the batch file is re-executed with a closing parenthesis as its first parameter and FOO.COM as the second.

Certain techniques involving undocumented features of the FOR command don't work in DOS 7 (the version that underlies Windows 95). However, everything shown here is completely documented and works fine in DOS 7. It takes a particular kind of mind to work out such elegant techniques using simple DOS commands!

You can download the batch file mentioned here from PC Magazine Online. See the sidebar "Guide to Our Utilities" in this issue's Utilities column for downloading instructions.

```
@echo %dbgd% off > %temp%.\ax}
 if [%1]==[] for %%v in (echo goto:End) do %%v Syntax: %0 COMFileName[* [?]]
 for %%v in (%1.com* %1!@{?) do call %0 )1st %%v
 for %%v in (1st 2nd 3rd) do if [%1]==[)%%v] goto )%%v
 if not exist %temp%.\{f} for %%v in (echo goto:End) do %%v File %1 not found.
 del %temp%.\{f}
 for %%v in (echo. echo.Done. echo. goto:End) do %%v
:)1st  { Parse the file name.              }
> %temp%.\comparing.bat echo %0 )2nd %2 %%4
> %temp%.\compari}.bat fc %2 *.
> %temp%.\{f}          compari}
 :)2nd  { Determine the length of the COM file. }
 if not %2==%3.COM for %%v in (echo goto:End) do %%v %2 is not a COM file.
             echo Disassembling %2 into %3.LST.
>>%temp%.\ax}    for %%v in (r q) do echo %%v
< %temp%.\ax}    debug %2 | find "AX=" > %temp%.\ax}.bat
> %temp%.\ax.bat echo %0 )3rd %2 %3 %%5
             %temp%.\ax}
 :)3rd  { Disassemble the file.             }
>>%temp%.\ax}    for %%v in (u100l%4 q) do echo %%v
> %3.lst         echo.  Disassembled File: %2
>>%3.lst         echo.
< %temp%.\ax}    debug %2 | find ":" >> %3.lst
 :End
 for %%v in (%temp%.\ax}.* %temp%.\ax.bat? %temp%.\compari*.bat) do del %%v
```

FIGURE 1: *This cryptic batch file disassembles .COM programs using DEBUG. It requires that your TEMP directory be on the PATH.*

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Ask Our Advisors

HARDWARE

Boardroom Battle

I recently upgraded to a Pentium system and discovered that some of my full-length expansion cards won't fit in the case; the cooling fan mounted on the CPU gets in the way. Are there any adapters on the market that will let me mount these boards either about an inch higher in the expansion slot or at an angle? Do you have any suggestions, or am I simply forced to replace these boards with shorter versions?

PHIL WILSON, *via fax*

PC MAGAZINE: Computer manufacturers often seem to ignore the physical requirements of older expansion cards, as more and more systems fail to offer unobstructed slots for full-length cards. Internal fixes are not likely to help, because the mounting brackets on the case won't be in the correct position. You could get an external expansion-card case, but these are expensive, and not all expansion cards will work in them. Unfortunately, the least-expensive solution in this case may well be to simply replace the older cards with new, smaller ones. You might be able to get a performance increase in the process, which may take some of the sting out of the situation.—*Alfred Poor*

Seeing Double

I'd like to install a second monitor in my PC so I can work with Windows on two screens at the same time. I know you can install a Monochrome Display Adapter (MDA) or a Hercules monochrome adapter in addition to a VGA card, but I want two graphics screens. Do you know if there is any way I can install a second card in my system?

GHIJSELINCK CHRISTIAAN, *Gent Zwijnaarde, Belgium*

PC MAGAZINE: There's no way I know of to install two standard VGA adapters in one system. The MDA/VGA approach works well, though the screens are not exactly simultaneous: DOS TEXT–mode images will appear on the MDA screen, and graphics modes will appear on the VGA monitor. Some programs—notably CAD applications—are designed to take advantage of this split, but unless you can run an application in DOS in full-screen mode under Windows, it may not be that useful.

There's a new product on the market, from Appian Technologies, that allows you to connect two VGA (or SVGA) monitors to a single card, and then display different parts of your Windows workspace simultaneously. You can even install a pair of these cards to get four screens at once. For more information, see the First Looks review of the Impulse A2 graphics adapter in our issue of May 14, 1996. Alternatively, you can contact Appian Graphics on the World Wide Web at *http://www.appiantech.com.*—*Alfred Poor*

OPERATING ENVIRONMENTS

Managing Program Execution in a Windows 95 Batch File

I fell in love with CDPLAYER.EXE and immediately started to record track data for all of my audio CDs. About halfway through this task, I apparently exceeded the physical limit of the CDPLAYER.INI

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file, which seems to be about 64K.

As a workaround, I created several .INI files named CDPLAYER.1, CDPLAYER.2, and so forth, and I constructed a batch file that will copy one of them over CDPLAYER.INI, run CDPLAYER.EXE, and then copy any changes back to the source file. I noticed that the batch file finishes execution before I close CDPLAYER.EXE and therefore any modification of the Play List—although saved in CDPLAYER.INI—is not copied to the source file. The updating of, say, CDPLAYER.1 should occur after CDPLAYER.EXE is closed. Can this be accomplished automatically?

WERNER P. HILTPOLD,
Boniswil, Switzerland

PC MAGAZINE: Indeed, .INI files are limited to 64K in size. It's rare for a program to hit that limit, except when the .INI file is being used as a poor man's database. That's precisely what CDPLAYER does, and that's where the problem lies. CDPLAYER stores several hundred bytes of information about each CD—just how much depends on the length of the track names you use. If your collection is substantial, 64K is just not enough space.

Using a batch file to run CDPLAYER and maintain multiple .INI files is a good idea. The catch, as you've noticed, is that after a Windows 95 batch file launches a Windows program, it goes right on to the next instruction, running simultaneously with the program it launched. The START command provides an effective solution, however. Insert "START /W" in front of the batch file line that launches CDPLAYER.EXE. The /W switch means Wait; this command launches CDPLAYER and waits until that program terminates before executing the next batch file command.
—Neil J. Rubenking

Read Windows Help Files Sequentially

Do you know of any utility that would allow an application's help file to be read on-screen like a conventional book, with one chapter following another? Hypertext links are great for investigating a particular topic, but cumbersome if you want to read all of the topics, which is required these days in the absence of printed manuals. If not, how about writing one for your Utilities section?

ALISON CHASE, *via ZD Net*

PC MAGAZINE: You don't need a utility to read help files sequentially. Just make one little tweak to WIN.INI and WinHelp itself can become a sequential help file browser. Here's how to enable this feature, which works with both Windows 3.*x* and Windows 95: Load WIN.INI into your favorite editor and locate the section titled [Windows Help]. If you don't find a section with this name (and in Windows 95 you probably won't), simply create the header. Just after the [Windows Help] section header, insert this line:

```
SeqTopicKeys=1
```

Now restart Windows. Load the help file that interests you into WinHelp and open it to any topic. When you press Ctrl-Shift-Right, WinHelp advances to the next sequential topic in the help file. Ctrl-Shift-Home jumps to the very first topic in the help file. Ctrl-Shift-Left will back up to the previous topic in a Windows 95 help file, but not in a Windows 3.1 help file, even when running under Windows 95. However, the Back button will back up through any topics you've viewed in the current session.

The one possible problem with this approach is that some help files are just not arranged in any kind of internal sequence. It's possible for a help file developer to add new topics in no particular order, with the apparent order imposed later by means of jumps and browse sequences. The actual sequential order of the topics within the help file may not be meaningful, in which case no sequential help file reading utility could help.
—Neil J. Rubenking

Windows 95's Scary LOCK Command

In the User-to-User column of January 23, 1996, you explained how to load Windows 3.x on a computer that already has Windows 95 on it. I tried the method as outlined, and a very scary error message popped up relating to the LOCK command: "Windows has disabled direct disk access to protect long filenames. To override this protection see LOCK/? command for more information. The system has been halted. Press Ctrl-Alt-Del."

I'm having difficulty locating any documentation on this command—it's barely mentioned in the Resource Kit. Can you please explain what the LOCK command is for?

SHELDON FINGERMAN,
Aspen, Colorado

PC MAGAZINE: Windows 95 uses a 32-bit file access system and long filenames. Programs that directly access the disk are making an end run around the file system and can indeed damage long filenames. Thus, Windows 95 traps any calls to the internal functions for direct disk access and displays that scary message. The LOCK command enables direct disk access to a specified drive. Before doing so, it asks for confirmation and presents an even more alarming message suggesting that disk corruption and data destruction are imminent if you answer Yes.

Fortunately, there is a way around this that doesn't require you to run the LOCK utility. What you need to do is install Windows 3.*x* *without* installing a permanent swap file. In order to speed up its virtual memory system, Windows 3.*x* stakes out a specific area on the disk for its permanent swap file and manages that area using direct disk access. Without the permanent swap file, you won't run afoul of the LOCK command. And since Windows 3.*x* isn't your main operating system anyway, it doesn't make sense to devote megabytes of hard disk space to its permanent swap file.
—Neil J. Rubenking

WORD PROCESSING

Changing Paired Codes In WordPerfect for Windows 6.1

I recently had to change italicized text to underlined text throughout a long document when submitting that document for publication. WordPerfect technical support insisted this can't be done, but I managed to do it anyway.

In WordPerfect, italics and underlines are paired codes, so italic text, for example, starts with an [Italc On] code and ends with an [Italc Off] code. Unfortunately, you can't simply search for all the [Italc On] codes and replace them with, say, [Und On] codes, and then do the same for the Off codes. If you try, you'll find that each time you replace one half of the pair, the other code disappears from your document. The solution, therefore, requires an intermediate step.

Start by choosing two characters or combinations you haven't used in the document. I'll use } and { in this example. Then find the first instance of italics, go to the Off code, and add } after the code. If you don't add this, you won't have a marker at this position, since WordPerfect will delete the first Off code when it replaces the first On code.

Next, use WordPerfect's Find and Replace feature to search for the [Italc On] codes and replace them with {[Italc On]. Then search for the [Italc Off] codes and replace them with [Italc Off]}. Now you can search for { and replace it with [Und On] codes, then search for } and replace it with [Und Off] codes. Finally, search for [Italc On] codes and replace them with nothing to remove all the italic codes from your document.

GREG GUNTHER,
Rolling Hills Estates, California

PC MAGAZINE: If you've painted yourself into this particular corner, Mr. Gunther's approach will certainly get you out of it. But if you're not already familiar with all of Word-

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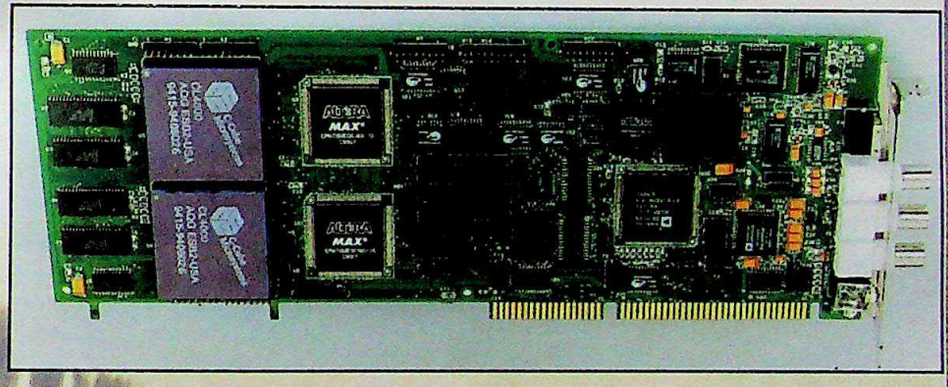
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Perfect's find-and-replace options, you may find it useful to go through some of the details, since the procedure for searching for and replacing codes is a little less obvious than it might be.

To search for a code and replace it with another code or with the same code plus some text, choose Edit | Find and Replace to open the Find and Replace Text dialog box. Choose Match | Codes to open the Codes dialog box. In the Codes dialog box, highlight the code you want to find (in this case, the [Italc On] code) and choose Insert to insert it in the Find text box. Next, go back to the Find and Replace Text dialog box (using the mouse or Alt-F6) and move the cursor to the Replace With box. Then return to the Codes dialog box, highlight what you seek to replace, and choose Insert to insert the code in the Replace With text box. You can then add any other text you need in the Replace With box.

Before you give the command to replace the codes in the document, you'll have to make sure the Action menu in the Find and Replace Text dialog box is set to Select Match. You'll also want to make sure the Direction menu has a check next to Forward and the Options menu has a check next to Begin Find At Top Of Document.

If you need to replace italics with underlined text more than once, you'll probably want to record all of these steps in a macro. To record the entire procedure, hit Ctrl-F10 to bring up the Record Macro dialog box, enter an appropriate filename in the Filename text box, and choose Record. When you're finished running through all the steps, hit Ctrl-F10 again to stop recording. And note that you can include the first step—adding that marker after the first [Italc Off] code—as part of the macro. Simply search for [Italc Off], then return to the document and type } or another marker character.

Not so incidentally, if you know beforehand that you'll need underlined text in the submitted version of a manuscript, but you still want to see the italics on-screen as you work, you might think it's a good idea to use a paired-character style to format the text with italics instead of using italics directly. In theory, changing italics to underlined text would then be a simple matter of redefining the style. That's not only easier than running multiple search and replace commands, it's also a lot faster.

Unfortunately, there is a danger to using character styles this way. Under some conditions, WordPerfect will add direct formatting codes instead of style codes when you try toggling the style on and off at various places in your text. If you then redefine the style, you may be surprised at the results, since changing the style won't change the direct formatting codes. Because of these complications, you should stay away from character styles if you expect to redefine the styles.
—*M. David Stone*

SPREADSHEETS

Nested Subtotals in Excel

I'm having trouble creating nested subtotals with Excel's Subtotals command. The description in the manual is clear and works perfectly. But in the example used by the manual, at every break in the first field there's always a break in the second field. This isn't always true with my data, and the nested-subtotal feature fails when the second field doesn't change where the first field does. Figures 1 and 2 illustrate this problem.

Before subtotaling, the data in the table was sorted first by Salesperson, then by Type. In Figure 1, I've subtotaled the Sales field after every break in the Salesperson field. So far, so good.

Figure 2 shows the disaster that occurred when I added another subtotal to Figure 1. I subtotaled the Sales field again, this time after

	A	B	C	D
1	Salesperson	Type	Units	Sales
2	jones	bread	5	5000
3	jones	meat	10	10000
4	**Jones Total**			15000
5	smith	meat	6	6000
6	smith	sugar	7	7000
7	**smith Total**			13000
8	wilson	bread	8	8000
9	wilson	meat	9	9000
10	**wilson Total**			17000
11	**Grand Total**			45000
12				

FIGURE 1

	A	B	C	D	E
1	Sum of sales	type			
2	salesperson	bread	meat	sugar	Grand Total
3	jones	5000	10000	0	15000
4	smith	0	6000	7000	13000
5	wilson	8000	9000	0	17000
6	Grand Total	13000	25000	7000	45000
7					

FIGURE 3

	A	B	C	D
1	Salesperson	Type	Units	Sales
2	jones	bread	5	5000
3		**bread Total**		5000
4	jones	meat	10	10000
5	**Jones Total**			15000
6	smith	meat	6	6000
7		**meat Total**		16000
8	smith	sugar	7	7000
9		**sugar Total**		7000
10	**smith Total**			13000
11	wilson	bread	8	8000
12		**bread Total**		8000
13	wilson	meat	9	9000
14		**meat Total**		9000
15	**wilson Total**			17000
16	**Grand Total**			45000

FIGURE 2

	A	B	C	D	E
1	Salesperson	Type	Units	Sales	
2	jones	bread	5	5000	
3	**Jones Total**			5000	
4	wilson	bread	8	8000	
5	**wilson Total**			8000	
6		**bread Total**		13000	
7	jones	meat	10	10000	
8	**jones Total**			10000	
9	smith	meat	6	6000	
10	**smith Total**			6000	
11	wilson	meat	9	9000	
12	**wilson Total**			9000	
13		**meat Total**		25000	
14	smith	sugar	7	7000	

FIGURE 4

The Sales field is subtotaled after every break in the Salesperson field, and the subtotals are correct (see Figure 1).
The Sales field is subtotaled again, this time after every break in the Type field; the results are incorrect (see Figure 2).
The correct results, obtained using Excel's Pivot Table feature (see Figure 3).
Sorting by Type first to get the correct results (see Figure 4).

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every break in the Type field. Notice that the table now reports that Smith sold $16,000 worth of meat (instead of $6,000), and it includes no subtotal reflecting Jones's meat sales. In short, this is useless, and if I hadn't been alert, I could have submitted an inaccurate report based on Excel's faulty Subtotals command.

I did manage to get the correct results by using the Pivot Table feature (Figure 3), but I'd rather use Subtotals if I can make it work. Can you clarify?

MIKE BERRISFORD, *Juneau, Alaska*

PC MAGAZINE: The bottom line is that the Subtotals command is not as smart as it needs to be, as you have already discovered. And you also discovered the solution: If you want nested results, forget Subtotals and use a pivot table instead.

The SUBTOTAL function is designed to add up a column of cells while skipping over intervening SUM or SUBTOTAL formulas. So, for example, cell D5 in Figure 2 uses the formula

```
=SUBTOTAL(9,D2:D4)
```

to generate a subtotal for Jones. The function adds up D2 through D4 (the first argument, 9, tells it to add; you can also use the function to calculate averages, maxima, minima, and so on), but it ignores the value in D3 because there's another SUBTOTAL formula in that cell.

The Data menu's Subtotals command gives you a convenient way to apply the SUBTOTAL function. Like a wizard, the command asks you what you want to subtotal, and then inserts rows, builds formulas, and outlines the result for you automatically. The problem is that the command doesn't always know what range to put into the SUBTOTAL function's second argument. In D7, for example, it writes

```
=SUBTOTAL(9,D4:D6)
```

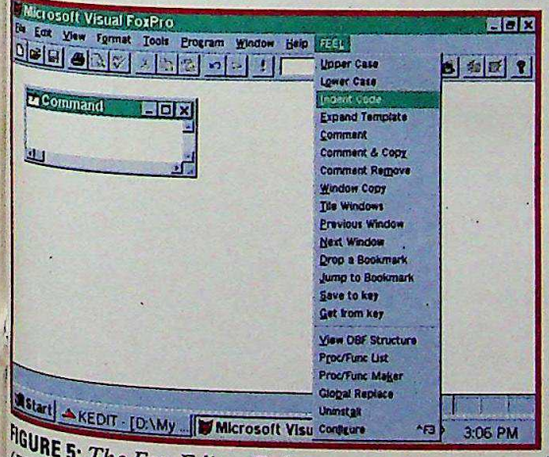


FIGURE 5: *The Fox Editor Enhancement Library (FEEL) for Visual FoxPro provides a long list of needed improvements to Visual FoxPro's editing environment.*

because it isn't clever enough to recognize that Smith's meat and Jones's meat don't belong under the same wrapper.

If you had sorted your data first on the Type field, then on the Salesperson field, you would have come up with the nested subtotals shown in Figure 4. The numbers are fine in this table, and you can use the outline buttons to manipulate the level of detail. But this table still lacks the clean simplicity of Figure 3. For summarizing numeric information on multiple fields, a pivot table is really the way to go.

—*Craig Stinson*

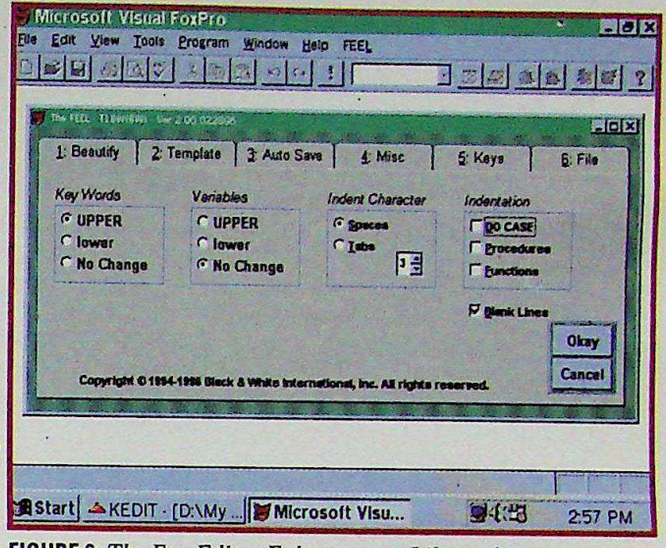


FIGURE 6: *The Fox Editor Enhancement Library lets you auto-indent code and change the case of keywords and variables, much like the Beautify features in the older FoxPro for Windows.*

DATABASES

Getting The FEEL for Visual FoxPro

The March 26, 1996, column noted that the useful Beautify function in FoxPro for Windows had been removed from Visual FoxPro. You suggested replacing that functionality using the COB Editor Extensions, but this functionality also exists in the Documenting Wizard. Just click the Tools menu, select Wizards, then select Documenting. The wizard can beautify an entire project in one pass, or, if you prefer, it can beautify individual programs one at a time.

STEPHEN M. WALTON, *Chicago, Illinois*

PC MAGAZINE: That's true, but the Documenting Wizard does not a Beautify make. The documenting wizard, like FoxPro for Window's Foxdoc program, is geared toward documenting whole files or projects, whereas the Beautify feature in FoxPro for Windows is much more singular in purpose and works directly on your active editor window. Thus, Beautify lets you splatter a bunch of sloppy code at high speed in an editor window and then, two clicks later, turn it into nicely indented code right where it sits. Even with the Documenting Wizard, I find I miss Beautify.

Luckily, I recently discovered the "Fox Editor Enhancement Library" (FEEL) for Visual FoxPro. This $99.95 product, in late beta as I write this, installs onto Visual FoxPro's menu bar (Figure 5) and not only supplies the missing Beautify features but a host of other enhancements as well (Figure 6). Like Beautify, FEEL will indent your code according to your preferred spacing and change the case of keywords and variables. (You'll recall that the version of the COB Editor Extensions I looked at in March does not change the case of keywords.) You can also use the product to change blocks of text to upper- or lowercase, to comment or uncomment blocks, or to select a code block for further action. For example, if you press Ctrl-S at an IF, the entire IF-ELSE-ENDIF code block is selected.

You can quickly jump to a procedure or function in your code using the built-in function lister, create or jump to bookmarks, view .DBF file structures, and auto-expand keyword text into programming constructs. And, in my own testing, FEEL seems quite fast. For more information, contact Black & White International at 800-932-9202 or 212-666-4030.

—*Sal Ricciardi*

Readers are invited to send their queries regarding PC usage to the Editor, *PC Magazine India.*

Selected queries will be answered in the *PC Solutions* department.

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PC as an Educational Tool

PC is fast emerging as an excellent tool for mass education. But can India make the best use of it?

Spreading education in India is becoming such a mammoth task that conventional methods of education involving school/ college buildings and teachers may no more be able to cater to the needs of the hundreds of millions of students who seek education at various levels every year. It is well known that seeking admission to professional colleges has now become a herculean task; indeed, getting admission in colleges offering plain graduation degrees in arts, science, and commerce, which used to be so simple earlier, involves enormous difficulties today, with a large number of students unable to secure a seat. Hardships are increasing day by day in admitting a child to school, with good schools already rejecting students in thousands. These problems will intensify in the future, especially in a country like India, where population is growing exponentially while infrastructural facilities are growing at a snail's pace. Nevertheless, India is ambitious in spreading literacy, as is borne out by the fact that there has been a growing demand to provide free and compulsory education for all children upto the age of 14 by the year 2005.

For one thing, we take great pride in saying that India has the third-largest pool of technical and scientific manpower; but an important point missed is that India has among the lowest scientists and technicals per 1,000 persons. The figure for India is merely 3.5, as against 85 in developed countries and nine in developing countries. Though the literacy rate in India today is over 50%, matriculates are just 6%, while graduates are merely 2%. In the highly competitive global economy, matriculates and plain graduates have little contribution to make, what with the vast number of the so-called literates in the Indian context, who can read, write, and do arithmetic in any language to be considered a literate.

The need for primary as well as advanced education cannot be overestimated. And at the same time, we cannot envisage that the country will be able to develop the educational infrastructure that is required today, or will be required in the future, to take care of the educational needs of the nation. Obviously, we need an alternative to the conventional means of education.

An example from Australia of such an alternative may be relevant for us. The Royal School of the Air in Australia has used IT very successfully in disseminating interactive education to thousands of spatially separated children. One teacher alone suffices for the job, and the students too can learn without having to go to schools or colleges. The study involves a two-way radio and conferencing on the radio. The teacher is in a broadcasting room, and through communications equipment he can pick up any student for quizzing or interrogation. The student too has individual access to the teacher. He can press a call button and through radio can reach his teacher, and the teacher knows from whom the request has come. In this way thousands of spatially distributed children are able to learn without having to go to school. The student-teacher ratio, which is often the subject of debate in the Indian context, becomes irrelevant in this method of teaching.

In fact, India has already used IT techniques in the past for disseminating education. Satellite beaming of educational programmes for farmers, and video-tape assisted teaching and learning are well known to India. However, none of these programmes could achieve anything close to what Australia's Royal School of the Air has achieved. One of the principal reasons for India's poor achievements was lack of commitment. Take for example the VCP and video-tape assisted teaching and learning. Lessons were recorded on video cassettes. The lessons were from an actual classroom with a model teacher, stimulating his students to be participative. Villages were provided with community video cassette players and the local teacher was supplied with a library of video cassettes with lessons on different subjects for different classes. But power cuts and poor maintenance of VCPs made a fiasco of the effort. Local teachers were found to be too insincere for the job, and VCPs were used more for entertainment than for education. The VCP would be at the mercy of the local powerfuls, who would use it for purposes most suited to them. Worst of all, VCPs would disappear from the community center, bringing to an abrupt end the saga of spreading education through IT.

The satellite-beamed programmes for farmers were well accepted by farmers in the initital phase, but gradually their interest withered away. The TV reception was far from clear, and the poor maintenance compounded the problem. As with VCPs, the disappearance of the community TV would suddenly halt the educational programme.

The latest development on education through IT is computer- communication-based instruction. Lessons are recorded and stored in digital form in central computers, say one or few per district. All class-rooms in the service area are linked to this central computer by telecommunication lines. Each class-room has a PC. A trained teacher could pick up any lesson from a directory. If the telecom link is wideband, several lessons for different classes in the same location can be simultaneously received over the same link.

With PCs becoming interactive and acquiring multimedia capabilities, students will be able to interrupt, ask a question, and get an answer. Linked PCs can access libraries and databases. Korean Telecommunications Corp. has donated 75,000 PCs for such purposes. TELU, a telephone company in Alberta in Canada, is working on similar lines. Denmark, Sweden, and Finland are using PCs extensively for education. The telecom companies in these countries are offering low-rate connections for educational purposes. The penetration of PCs in India is among the lowest in the world, hardly one per 1,000 persons. This is bound to improve, and every effort should be made to improve it. Each member of parliament is given Rs 10 million for development work in his constituency. There has been a proposal from many that each MP must spend some money in bringing PCs to schools in his constituency. So far there has been no response, but, hopefully, we may find a change of attitude.

Can PCs salvage the poignant educational scenario in India? It is difficult to answer this question, because though IT can provide the technology for India to achieve its educational goals, how can one prevent PCs from getting lost or going out of order?

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PROJECT MANAGEMENT: The Decision-Maker's Nightmare

Project management software has matured, but managers lack the expertise to use them.

Project management software has never been popular among managers in India. This is not surprising, considering the fact that most packages in this genre, from low-end scheduling programs to high-end multi-project management software, require a degree of specialization that is not evident among corporate decision-makers. For one thing, project management must control and mould information from not one but several fiercely independent departments, each insisting on its special perspective. Each department is likely to be using its own software, the results and projections of which may not tally with those of other departments, or those of the project management team. In practice, project management often turns out to be a dynamic battleground where personnel management, purchase, stores, accounts, and other departments tend to score points at the cost of one another. Under such circumstances, smooth handling of a project does not mean lack of constraints like resource crunch, non-availability of specialized personnel, and so on, but adequate coordination and cooperation between departments.

To confound matters, most project managers have to deal with several projects simultaneously. This means that the number of factors that must be effectively controlled gets multiplied by the number of projects being handled. Then there is every likelihood that the projects being handled simultaneously are so different in structure and content, that handling them into a common repertoire makes little or no sense. Yet, they draw resources from the same enterprise pool in terms of personnel, material, and equipment.

Even a couple of years ago, project management software had very little to offer in terms of user-friendliness and transparency. The developers worked on the assumption that the software will be used by experts who have all fundamentals on their finger-tips.

Today, user-friendliness and overall transparency have become prime considerations. Comprehensive electronic help is being provided by most packages at three levels—general, module-based, and context-sensitive. Help information can be retrieved by a single mouse click. One must hasten to add that despite these positive changes, project management software continues to be unwieldy, and it is still impossible for a novice to get going in a jiffy.

DOS-based packages have become more or less extinct. The ones that continue to linger are definitely on their last legs. This is because their Windows counterparts are more graphics-oriented, more user-friendly, incorporate more features, and are more flexible and versatile. Today's mainstream project management packages tend to involve more people. They offer a semblance of transparency, and permit information to be imported from a wider range of applications.

While going in for a project management package, the most important selection criterion should be the size and scale of the project being handled. Most project management software packages first prepare a list of the tasks that make up the project at hand, and the resources required to implement them including manpower, material, equipment, and so on. The number of these items determines the scale of the project. Small projects may have something like 100 tasks and 25 resources. Medium-sized projects might contain up to 1,000 tasks and 300 resource items.

For small- to medium-sized projects, the emphasis should be on the reliability and robustness of essential features. If a company normally handles small projects, it would be wasteful to burden it with a sophisticated high-end project management package boasting a plethora of complicated features that will never be used. A package that offers simple but robust task scheduling features, for instance, should suffice. In some cases, it might be better to keep tab on the project through traditional means, rather than through software. However, if the projects being routinely handled are large or unwieldy, it would be disastrous to try and keep all facts and figures on registers, or in the head.

The ability to work simultaneously with multiple projects is a crucial feature for many users. Preventing overlappings is one of the big benefits project management software offers. Most packages have at least some multi-project capabilities like support for a common resource pool for all projects, and the ability to do cross-project Gantt and PERT charts. Under optimal conditions, a good project management package can help in meeting deadlines, and in controlling specific and overall costs. It can be used to organize the many, often interdependent tasks of a project, allocate responsibilities on a scientific basis, monitor regular progress, and keep an eye on costs. Corporate decision-makers like the inherent ability of project management software to create order out of chaos, and to organize seemingly unrelated bits of data into meaningful information units.

Project management packages normally offer three types of customization—display options, processing options, and process enhancements. The value of each option depends entirely on specific needs, though the expertise required to extract the maximum from it may be a severe constraint.

For instance, automating repetitive parts of the project process requires some degree of proficiency in programming and creating micros. Mainstream project management software packages support programming and macro creation at various levels. The problem is, how many managers can create macros, or write scripts?

Other features common in project management packages of the day are support for object linking and embedding (OLE) and e-mail. Support for e-mail means that messages can be sent and received directly across the PC. Earlier, it was customary to take out hard copies of reports and then send them to the relevant people by hand. Thus, communication has become more sophisticated and effective. Some packages have started offering features like workgroup project management. For most practical managers associated with genuine project management, these are fancy features. However, in a shrinking world where cooperation and collaboration have become hallmarks of success, these cannot be ignored.

—Hirendra Chatterjee

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MARKET

Cals to Market Dell Products

The New Delhi-based Cals Ltd, a networking company, has entered into a strategic alliance with $3.5 billion US company Dell Computer, among the world's five largest PC companies. Cals will market and service Dell's products in



G. Nowitz (left), MD, Dell, South Asia & Pacific, with S. Goorha, MD, Cals.

India. Dell's key products are desktop PCs, notebook PCs, and high speed network servers. Says Sarvesh Goorha, MD, Cals, "Dell-Cals alliance brings the latest range of powerful file servers and desktops, along with the expertise of providing comprehensive solution under networking." This alliance will address the needs of customers in corporate and other segments.

Cals networking products range will include, in association with Dell, LAN, MAN and WAN interface cards, hubs, routers, and intelligent cabling systems. Cals also provides consultancy in network design, system studies, software development, system integration, and user training. Dell products are also distributed in India by Delhi-based PCL, Chandigarh-based ESPL, and Bombay-based Rolta India.

Seacom Brings INT, Data Nova Solutions to India

The Pune-based Seacom Solutions India has tied up with INT Solutions, Singapore, for document management and image processing solutions. Seacom will be INT's exclusive value-adding distributor in India.

Through this alliance, Seacom will be introducing a range of microfiling products for document management for the corporate, engineering, and financial sectors.

The first product to be launched is Micro-File Personal, which will be made available through OEMs. All papers and documents created in a PC can be managed through Micro-File Personal in files, folders, and cabinets. These documents can be retrieved on the touch of a finger through Probablistic and Boolean search facilities. One of the main features of Micro-File is that it reduces the size of every document ten times, thus enhancing the storage capacity of the PC ten times.

OEMs will bundle Micro-File Personal with PCs, not increasing the cost of the PC, but also bringing Micro-File to the consumer at almost no additional cost. The product is currently under evaluation, and very soon will be available with all the recognised brands of PCs in India.

Micro-File Personal will subsequently be made available through Seacom's countrywide dealer channel, for existing PC users.

Meanwhile, Seacom and Data Nova of Norway have set up a joint venture to market POS (Point of Sales) solutions. Data Nova will hold 60% in the new venture, and the balance will be held by Seacom. The company will be managed independently by Seacom Solutions, with all software technologies being provided by Data Nova.

With over 1,700 installations in Scandinavia and UK, Data Nova is a leader in POS solutions. According to Ajay Aggarwal, managing director, Seacom India, "Since Transaktor, which is the main backbone product of the POS solution, will be reproduced by Seacom in India, we will be providing one of the most cost-effective automation solutions for retail outlets in the country."

Seacom will provide flexible solutions for single unit stores as well as multi-city store chains. Says Mr Aggarwal, "We are building in financial accounting packages and databases modules with Transaktor, making it a comprehensive and integrated solution." Seacom will be distributing this product through a national channel network of solution providers. With this tie-up, Seacom India is all set to revolutionize retail automation in India.

Indo Infotech Introduces Adina, NIT CAE Tools

The Hyderabad-based Rs 50-million Indo Infotech Ltd has announced its agreement with Adina R&D Inc. of USA and Numerical Integration Technologies (NIT) of Belgium to re-sell to the Indian user their solutions in the area of finite element analysis, computational fluid dynamics, and acoustics. Indo Infotech, which primarily specializes in engineering and software consulting, is focused at catering to the high-end CAE needs of defence, aerospace, naval, automotive, heavy engineering, and large public and private sector clients, through these products.

The release of Adina V 7.0 Structural and CFD System has enhanced Adina's position in the FEA market as a comprehensive, high quality, general purpose analysis system suitable for 2/3-D linear and highly non-linear, static and dynamic, buckling, acoustic, field, thermal, CFD and fully coupled Fluid-Structure Interaction (FSI) analysis. It has a Motif-based GUI that allows users to analyse the complete problem within the GUI and is available on Windows NT for PC segment. Powerful animation capabilities and seamless integration with Pro/Engineer, I-DEAS, and Patran are also included.

Besides the powerful FSI capability, it has feature like fracturer mechanics with crack propagation, a vast range of linear and highly non-linear material models, cyclic symmetry analysis with non-symmetrical loads, and true contact elements that can handle unknown contact areas. Heat transfer module has radiation capabilities between surfaces of arbitrary geometrics, element birth-death option, and full coupling to other Adina modules. With the explicit formulation included, Adina is ideal for crash and crush analysis, metal forming, impact and blast analysis, and such highly non-linear and dynamic problems.

NIT is a leading developer of analysis software for acoustic and vibro-acoustic problem solving. Its prinicipal product Sysnoise has established itself as de-facto standard for acoustic CAE software. Sysnoise uses both Finite Element Method (FEM) and Boundary Element Method (BEM) to solve interior and exterior noise problems and radiation problems.

Versatility of Sysnoise recommends it

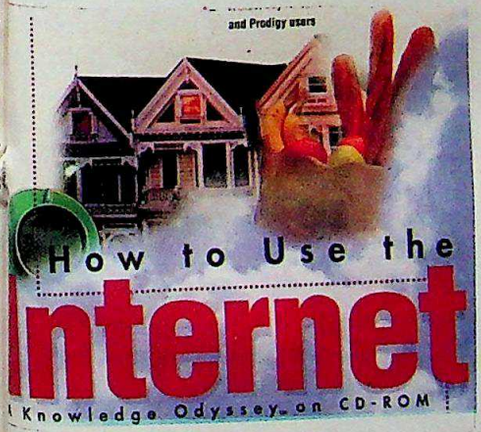
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for use in every aspect of acoustic design, such as in the evaluation and optimization of sound pressure within passenger compartments in cars, trucks, buses, trains, and aircraft to determine the characteristics of sound attenuating linings for investigating sound radiation from engine blocks, fuel pumps, power trains, transmissions, air filters, and other vibrating components; in evaluating structural vibration resulting from acoustics excitation (applicable to payload protection in aerospace); in evaluating the scattering of sound by obstacles; in calculations of the sound attenuation components of internal combustion engine exhausts; in reducing noise levels generated by household appliances (washing machines, refrigerators, vacuum cleaners) for industry leaders in automotive, aerospace, shipbuilding, household appliance, heavy engineering, and consumer electronics sector.

Boston Launches MindQ's Internet SW

The Bombay-based Boston Management Consultants, has announced the availability of *Internet: A Knowledge Odyssey,* a comprehensive computer-based training (CBT) software for the



Internet users. The package from US-based MindQ Inc. offers almost all available information, techniques, and software that one may need to make the most out of the Net.

The CBT package comes in two different versions, for home and business users. A variety of user-friendly modules such as tours, sites of Internet, connect to Internet, FAQs, and a 400-item glossary comprise the core of this CBT. Over 250 Net cruising tips along with a collection of stunning graphics and animation, coupled with excellent audio and textual descriptions, will help even newcomers to have a quick visit into the information wonder world.

The package also offers a self-paced multimedia tour of the Internet. The virtual tours are organized around what a user wants to do on the Internet. Once you are ready to surf, this software will take you through the realms of TCP/IP, e-mail, URLTelnet, Archie (not to mention Veronica), FTP, Usenet newsgroups, and so on. You will also get an opportunity to browse the World Wide Web.

The powerful query engine of the CBT package replies all your queries about the Internet with appropriate graphical presentations as and when needed. This helps users to interact with the software easily and delve into more details in short time.

Digital Machine to Power Lycos' WWW Service

Digital Equipment Corporation has announced that Lycos Inc. of Marlboro, Massachusetts, a premier Internet search and guide company, will power the Lycos free World-Wide Web service with Digital's 64-bit Alpha systems, 64-bit digital Unix operating system, and storageworks data storage technology.

The Digital solution includes AlphaServer 8400 enterprises systems, Alphastation 200 workstations, 320 gigabyte of storageworks, and DECsafe high-availability clustering software. The Lycos web site serves more than 100 million Internet requests for information each month and boasts a query growth rate of nearly 2,000% annually.

According to Lycos president and CEO, Robert J. Davis, "As our business skyrocketed, the Alpha machine came along at just the right time. Alpha has the power and expandability to keep up with the exponential growth companies like Lycos derive from the Internet. Running on the Alpha platform, our new centispeed technology provides users with four times the speed of other tools in the marketplace, and high relevancy in their Internet searches.'' Mike Gallup, Digital vice president, Worldwide Systems Marketing, said, "We are pleased that Lycos, with its supercharged speed and relevancy searching capabilities, has chosen Digital technology to implement centispeed. Lycos' experience is a good example of the reasons more and more companies are moving their Internet operations to Alpha. Today Digital provides complete 64-bit environment-system, operating systems; database, thousands of applications, and complete support and service resources".

Red Duck to Distribute AllClear III

The Bangalore-based Red Duck Distribution Company has announced the availability of allCLEAR III for Windows and DOS. AllClear III is an intelligent flowcharting product that helps people define, visualize, and manage their critical business procedures. AllClear III turns simple text into a visual map for easy communication of complex information through presentation-quality flowcharts, process flow diagrams, organizational charts, fishbone graphics, and others. This new version provides enhanced usability, more diagram types, easier distribution through a runtime viewer or through Lotus Notes, and finer control over diagram output.

AllClear III provides an easy way to create and maintain diagrams. It automatically creates and edits living diagrams from a text outline written on screen or from data imported from any text, dBase, Lotus 1-2-3 or Microsoft Excel file. Users can also use drag and drop templates to graphically create a diagram, and allClear III will automatically translate the information into a self-documenting text outline.

AllClear III is specifically designed to handle everything from the most simple organizational chart to multi-page, highly complex process flow diagrams. AllClear III automatically generates page connectors for multi-page diagrams and splits such diagrams at logical points for enhanced readability. Side-by-side text and chart views in a split screen allow users the option to see the results in their flowchart as they modify text. Various customization features in allClear III allow users flexibility as they produce multipurpose, presentation-quality diagrams. For example, users can move or resize boxes, create custom shapes, assign color to diagram elements, import graphics, and rotate entire diagrams.

AllClear III was developed with the realization that organizations are continually modifying their business processes. AllClear III gives the novice and the advanced user alike the ability to trans-

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form a complex business procedure into an easy-to-communicate visual diagram or flowchart without having to draw or redraw lines and move boxes. AllClear III is good for companies attempting to restructure; companies wishing to communicate structures and processes across the enterprise; and companies working towards ISO certification.

Red Duck has an office also in New York.

Powertel Boca Announces Price Cuts

PowerTel Boca has announced price cuts ranging from 20-30% on key products. Of special mention are price cuts on V.34 modems, 28.8 Kbps sound expression card, fast ethernet 100 Mbps cards, MPEG 64-bit graphic engines, and PCMCIA notebook modems.

After a successful launch of JV with Boca Research Inc. at its multimedia communications seminar, attended by over 1,200 delegates, PowerTel Boca is signaling its strategic focus on India with this offer. This offer is valid only for a limited period.

"With the announced price cuts PowerTel Boca has set a new standard in the modem, multimedia, and data communications industry by offering branded products with US-manufactured quality, complete with five-year warranty at affordable pices," says Dinesh Puri, managing director, PowerTel Boca.

PowerTel Boca is committed to bringing innovative and value enhancing products which allow computer users, either SOHO or corporate to upgrade onto multimedia, Internet connectivity, and communications technologies.

AST Claims Bravo Is a Best-Seller

AST's recently launched spring line of commercial desktops with their aggressive pricing has proved to be a success in India with some corporations opting for it. Within a month of launch, the new Bravo desktops are already one of the best sellers for AST in India. Priced below major competitors with comparably equipped systems, AST claims that the new Bravo desktops represent significant savings for end users. In addition, the new line adds value with good features. "The user of today is extremely savvy wanting power and performance without compromising on technology or value. He also wants a return on investment that doesn't sour in a year," says Ashish Bambroo, sales manager (India Operations), adding "The new Bravo line addresses these needs and allow users to move forward to the 21st century without having to worry about their PC becoming obsolute." AST Bravo is the first step of a new strategic plan chalked out by AST. The three year warranty of the new Bravo provides reliable three-year on site support which is essential to corporate users.

The new Bravo family launched in June 1996 incorporates leading edge technologies like Intel 430 HX PCI set, ATI mach 64 video technology (VT) graphics, SmartShare memory architecture, Synchronous Graphics RAM (SGRAM), and so on. With highly optimized subsystems and technologies, including 16 MB standard Extended Data Out (EDO) RAM and pipeline burst cache, the latest Bravo line offers enhanced power and performance to run today's sophisticated applications in addition to enchancing user productivity and efficiency. With its special safety features, voice recognition and virus protection, the new Bravo is good for industries like banking, manufacturing, and regular office use.

ASTL Designs Electronic Quilt

The Bombay-based Akshay Software Technologies Ltd (ASTL) has designed and developed "Electronic Quilt," a graphics design package for the Electronic Quilt Company, USA. The package is a quilt design system that allows the use of computer graphics tool to design quilt layouts and fabric prints which could be used in the complete design of the quilt. It is operational in DOS, and MS Win 3.1 operating systems.

The package contains exhaustive library of blocks, fabric swatches, and color palettes. The user can quickly and efficiently create any design using graphics like lines, arcs, rectangles and advanced bezier curves with the help of GUI. The package also allows the creation of block outline, paper piecing pattern or applique pattern.

Tulip India Offers Price Cuts

The Bombay-based Tulip Computers India has announced price cuts on its products following the Indian government's decision to slash import duty from 40% to 20% on computers and peripherals. Says Bill Kavi, MD, Tulip Asia, "Now that the duties structure in India, being more or less in line with Asia, Tulip has embarked upon an aggressive marketing strategy to increase its share in the Indian market."

The Tulip Motion Line notebook, and Tulip Vision Line desktop and desk expansion are now available at 16.4%, 17.15%, and 16.1% less cost respectively compared to the pre-budget price. The Tulip Vision Line offers models of desktop systems and servers for the professional market. It ranges from compact desktop machines to heavy-duty servers.

DCM-DS Wins Army Contract

The New Delhi-based DCM-DataSystems has won the order from ministry of defence for networking its command in Lucknow. The first phase of the total order worth Rs 50.5 million is Rs 14.8 million. DCM-DS will supply superstations, PS/486 systems, PS/Pentium systems to the ministry as part of a total turnkey project implementing the latest networking technology.

With this order, four out of five commands of the Indian army, viz., North, West, Central, and South, are being computerized by DCM-DS.

Tandem Supports Win NT Server 4.0

Tandem Computers Inc. has announced its support for Microsoft Win NT Server 4.0. Tandem and Microsoft agreed to cooperate as strategic alliance partners for Win NT Server customers. Tandem's technology is being extended to Win NT, including its business software ServerWare, and ServerNet cluster interconnect technology. Tandem is also a leading contributor to Microsoft's development of a common specification for

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lustering, codenamed "Wolfpack."

Roel Pieper, president and CEO, Tandem, says, "The guiding purpose of the Microsoft-Tandem strategic alliance is to accelerate customer adoption of Win NT Server in the business-critical market. It is clear now that customers need scalable systems that deliver fast, highly reliable data access. Win NT Server, with Tandem non-stop technology, directly addresses the customer need. Win NT Server is growing rapidly as a powerful, cost-effective platform and Win NT 4.0 is a significant step forward."

Tandem's cluster-enabled solutions manage more than 90% of the world's securities transactions, 66% of the credit card transactions, and 80% of all automated teller machine (ATM) transactions, and are used by 35 of the largest telecommunications companies.

Tandem Computers designs technology solutions to enable companies to compete in a business world that runs 24 hours a day. Its ServerNet architecture is a technology providing virtually unlimited bandwidth for media-rich data-driven business applications.

Computervision Wins Fiat Contract

Computervision Corporation has announced that Fiat Auto, Europe's second largest automobile manufacturer, has signed a software and services contract with Computervision worth $6 million. Under the three-year contract, Fiat will implement Computervision's Electronic Product Definition (EDP) solutions strategy for the development of their automative product line. The contract reinforces the long-standing partnership between Computervision and Fiat. Open EPD will allow Fiat to continue to leverage its investments in existing systems.

Computervision is an international supplier of desktop and enterprisewide product development software and services. The company's products, process data management (PDM) and design automation (CAE/CAD/CAM) software solutions, have helped manufacturers to improve product quality and reduce time to market.

Computervision has an R&D center at Pune where about 250 professionals are developing and designing PDM and design automation software.

IT Secure Provides Dr Solomon's Solutions

The Bombay-based IT Secure, the national distributor for S&S International, has announced Dr Solomon's solutions to provide both on-demand and on-access detection for the Excel, Macro, and Laroux viruses. Dr Solomon now provides on-demand detection for DOS, Win, OS/2, Netware, and SCO Unix, while on-access detection is for Win.

Laroux is the first ever replicating macro virus capable of infecting Microsoft Excel spreadsheets. It currently infects Microsoft Excel Version 5 and 7, on Win 3.x, Win95, and Win NT desktop operating systems. Macintosh computers do not appear to be infected with virus.

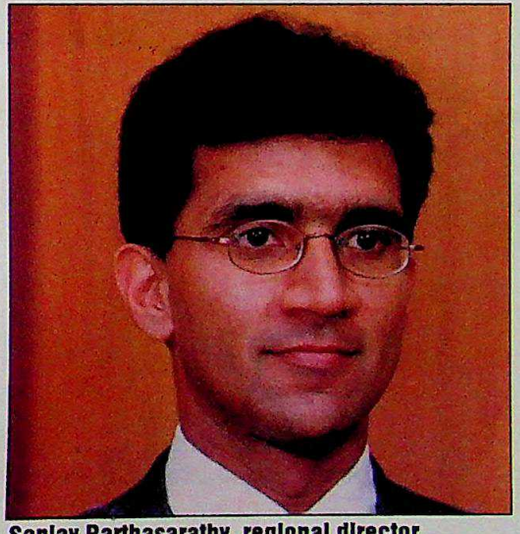
Dr Solomon is a leading international supplier of anti-virus software.

TIE-UPS

NIIT Is Microsoft's Training Partner

Microsoft has announced NIIT as its education and training partner. NIIT will incorporate Microsoft technologies and products into the core curriculum of the GNIIT program.

As a part of the agreement, the GNIIT course is being upgraded to include Microsoft products such as Windows NT, Microsoft BackOffice, Windows 95, SQL server, and Microsoft's Internet products. NIIT plans to train over 10,000 students on Microsoft technologies in the coming year. It will also set up a "Center Of Competence" to showcase all of the Microsoft backoffice, networking, and Internet technologies. This will be a "proof-of-concept" center that will demonstrate diverse solutions on Microsoft platforms. In addition, NIIT will be upgrading the hardware in its education centers and computerdromes to enable training on the new platforms.



Sanjay Parthasarathy, regional director (Indian subcontinent region), Microsoft.

"India has the potential to be the largest source of trained software professionals in the world," says Sanjay Parthasarathy, regional director, India Subcontinent Region, Microsoft. "With NIIT's nationwide presence and global efforts, we have together taken a very important step forward to achieving this goal." The Microsoft Certified Professional (MCP) program offers three certifications based on specific areas of technical expertise: Microsoft Certified Solution Developer (MCSD), Microsoft Certified Systems Engineer (MCSE), and Microsoft Certified Product Specialist (MCPS). The certification will ensure that computer professionals are skilled in implementing and supporting solutions with Microsoft products. Students have the choice to attain the MCP certification at various stages of the GNIIT course.

Students who are currently pursuing the GNIIT programme will have access to bridge courses to move towards Microsoft Certification at NIIT's Centers for Advanced Technological studies. Additionally, the course content will automatically be upgraded as and when Microsoft launches new products. This will enable a simultaneous availability of professionals to handle a newly launched Microsoft product. On becoming a Microsoft Certified Professional, the software specialist will gain membership to the world-wide elite group of professionals recognised as experts on Microsoft products. These individuals will receive regular technological updates made available regularly on the Microsoft TechNet technical information network, invitations to key seminars and events, and discounts on Microsoft books and products.

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Symmetric Represents Transitional Technology

The California-based Transitional Technology Inc. (TTi), an unattended tape backup provider, has signed an agreement with the Bangalore-based Symmetric Technologies to deal with its entire product line.

Symmetric would provide unattended tape backup solutions and network-based storage products to customers who have mission-critical applications and high volumes of data.

TTi offers 4mm, 8mm, DLT, and DTF tape formats to the network-attached storage server series, NX Server. All TTi tape backup subsystems and libraries are plug-and-play compatible with HP 3000/9000, Sun Sequent, IBM RS/6000, DEC, SGI, IBM AS/100, PCs and compatibles, Macintosh, and so on.

Symmetric, a business partner of DEIL through an authorized service representative agreement, hopes to enhance its activities by addressing this niche market.

TTi is a designer and manufacturer of solutions for client/server computing and a leading integrator of networking, workstation technologies for mission critical and high performance systems. All TTi products are available through direct sales and reseller channels worldwide.

Advantec Expands Distribution Network

Advantec Network Systems, the specialized networking product distribution company, has doubled its number of system integrators from 65 to 126 during the last six months. As business users are increasingly implementing networking solutions throughout the length and breath of the country, Advantec plans to extend its reach to smaller towns and cities. Advantec aims to take its products to the interior by appointing system integrators (SIs) who are dominant players in their respective regional areas. Advantec has also stepped up support services and training programs to help SIs meet challenging tasks especially in the face of ever changing technology.

Advantec proposes to start two full-fledged training centers in Bombay and Bangalore. The training will be offered in collaboration with AT&T, UB Networks, American Power Conversion, Microtest, and RND.

Says Prakash Advani, president, Advantec, "If we have to expand our reach, we have to support system integrators not only through better products and improved services but also through friendly credit schemes to enable them to expand their businesses and be virtual back bone to the system integrators." Advantec has recently introduced an innovative credit scheme under which SIs will be able to avail of 90 days credit on networking products. This would enable professionals and smaller solution implementers, who do not have large resources at their command but have capacity to service larger client base, to realize their full potential of business development.

Advantec has recently opened an office in Ahmedabad, thus increasing the number of Advantec branch offices to 10. It has four warehouses and two regional depots in the country. Advantec has been increasing its product line through formalizing tie-ups with leading international companies in the area of networking. According to Mr Advani, "Advantec provides the complete range of networking products from the back of the PC through the entire private network and aims at becoming the networking solutions leader in India and the entire SAARC region".

HCL-GA to Vend Toshiba Notebooks

HCL-Global Alliance, the newest company of the HCL Group, has entered into a marketing and distributorship tie-up with Toshiba Corp., world leader in portable computing products, for their varied range of Toshiba notebooks in India. HCL-GA will create and manage a marketing and support infrastructure for Toshiba notebooks.

Says Arjun Malhotra, vice chairman, HCL Corp, and supervising director, HCL-GA, "The notebook or personal computer market is growing at a phenomenal rate globally. In fact, 30% PCs sold in the US were notebooks in 1995. Although India is a nascent market currently, it is expected to boom in the coming year. Estimates are that the total size for notebooks will be in the range of Rs 4.5 billion. At HCL-GA, we will dominate and lead the notebook market in India."

HCL-GA will market suite of Toshiba notebooks including the Satellite 100CS, Satellite 110, Satellite Pro 420, Tecra 500, Tecra 720CDT, and Portege 650CT. The Pentium-based Toshiba notebooks provide Internet access, CD-ROM drive, e-mail facility, sound blaster for stereo sound. These are upgradable to future technological advances. Toshiba has a market share of over 21 per cent and a total sales of over 1.4 million units in this product segment. HCL-GA has set a special distribution channel for marketing and creating a brand equity for Toshiba notebooks in the country. The company has entered into agreement with channel partners like Business Link, CMS Computers, HCL Frontline, Tangerine Informatique, and Teknotron Information Systems. The company has set up support centers for its distributors in Bombay, New Delhi, and Bangalore. These centers will provide service and support for test and repair, logistics and spare parts availability.

Autodesk Acquires Creative Image Technologies

Autodesk, the leading provider of design software tools and content, announced the acquisition of Creative Imaging Technologies Inc. (CIT), a software and digital imaging California-based company. Targetting the decorating and design markets extends Autodesk's reach beyond its traditional markets of design professionals like architects, mechanical designers, engineers and animators, and moves it closer to consumers.

CIT will be integrated with Autodesk's Advanced Products Group (APG), which will continue to deliver CIT's current products and services. CIT developed and marketed Designer's Vision software, a software for product sampling and project visualization used by interior designers, specifiers, and decorating retailers.

Says John Lynch, VP of Autodesk's APG and chief technical officer, "The CIT acquisition expands our portfolio of solutions for design professionals into a whole new range of possibilities for delivering digital content. Integrating this content with our modeling and visualization technology will provide a new level of realism and bring the steps of design and shopping together for the first time."

CIT has well established relationships

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ith more than 15 top suppliers of interior nish products, including F. Schumacher Company, Hunter Douglas Window shions, Imperial Wallcoverings, Kravet abrics, and Robert Allen Fabrics.

Designer's Vision software users can earch for and view samples of fabrics, allcoverings, floorings, paints, and oth- decorative products. The product re- laces hundreds of sample books with igitized true-color images on CD-ROMs. saves time and space, and helps design- s evaluate and compare different color nd finish combinations and costs.

APG is the group within Autodesk hat pursues business opportunities adja- ent to and outside Autodesk's original esign markets. One of APG's goals is to rovide a new generation of design tools hat is accessible to a whole new set of ustomers.

Autodesk is the world's leading sup- lier of PC and Unix- based design soft- are and PC multimedia tools. The com- any's 2D and 3D products and data anagement tools are used in many in- ustries for architectural design, mechan- al design, film and video producers, ideo/games developers and Web content evelopers. Its Kinetix division is the eader in PC-based 3D modeling, provid- g a full range of products for the appli- ation development process from 2D and D creation to assembly and delivery. The ourth largest PC software company in the orld, Autodesk has three million cus- omers in nearly 130 countries.

Autodesk's Indian partners are Delhi- ased HOPE and Pune-based Neil Auto- ation.

eagate on artnership Spree

Seagate Software Management Information Group, a prominent player in client/server data access and reporting oftware, has signed 42 new product- undling OEM (original equipment man- facturer) partnerships for its Crystal fam- y of reporting software, including Crys- l Reports, Windows Report Writer, and rystal Info.

Partners include technology industry eavyweights and leading applications endors such as Microsoft, Oracle, etscape, PeopleSoft, Symantec, Fujitsu, d Aspect Telecommunications. A num- r of vendors with applications requiring high volume reporting, including Rockwell Switching Systems Division and FASTech Integration Inc., chose to bundle Crystal Info for its advanced information sharing, time and event-driven scheduling, and offloaded processing capabilities.

Crystal Reports and Crystal Info are bundled in both developer tools and vertical market applications including accounting, financials, human resources and payroll, healthcare, and telecommunications. New product bundles for Crystal Reports and Crystal Info in 1996 include Oracle's Oracle Power Objects; Allaire's Cold Fusion; Netscape's LiveWire Pro; Medsoft's Optimizer; State-Of-The-Art's Actuity Financials, MAS90 for Win, and BusinessWork for Win; Best Program's FAS product Group; Microsoft's Windows NT Resource Kit and Microsoft Exchange Resource Kit; Rockwell Switching Division's Total ReCall Reports; Atwork's Healthcare software; Solomon Software's Solomon IV; Pegasus Software's Capital 32; FASTech Integration's FactoryWorks; and Blackbaud's Raiser's Edge charity software.

PeopleSoft is another partner for Seagate Software, and has integrated Crystal Reports in its client/server application software for human resources, financials, manufacturing, and distribution.

Seagate is represented in India by ACI Infotech and Apcom.

NTT Selects Novell to Deliver Global Networking Solutions

The California-based Novell Inc., and the largest telecommunications company in Japan, Nippon Telegraph and Telephone Corporation (NTT), have announced the availability of NTT Network Connect Services (NNCS) based on Novell's Directory Services (NDS). NNCS will provide Japanese companies with business-class Internet/intranet services that extend the reach of traditional networks to include customers, partners, and vendors, allowing businesses to be more responsive to customer needs and changing markets. NNCS will connect Japanese businesses to more people, information, and resources they need to maintain a competitive advantage.

NTT joins AT&T as the world's second largest telecommunications company to deploy Novell's NetWare Connect Service (NCS) as their business-class internetworking service. By subscribing to a business-class Internet service, customers gain direct access to all Internet applications and resources with the added benefits of a secure, reliable, and managed network environment. NCS became commercially available in 1995 through AT&T's NetWare Connect Service (ANCS) and is currently serving a rapidly growing base of AT&T and Novell customers.

NNCS enables businesses to outsource the complexity and cost of maintaining wide-area intra- and internetworking access, while gaining a higher level of network security, reliability, and management. A key technology incorporated into NNCS is NDS, the industry's most-widely adopted directory service. NDS will be used as the global directory within NNCS providing a single source for locating and accessing customers, business partners, vendors, and network resources through a private, secure, and reliable Internet service. Through a single login, users can also access all network and Internet services and applications.

NNCS provides businesses with the opportunity to benefit from a global network without the costs associated with creating, maintaining, and upgrading an internal network infrastructure. Additionally, NNCS enables customers and select partners to access the network from remote locations, improving a company's productivity. For example, a company with several offices can allow authorized users direct access to the NNCS network—saving both valuable time and overhead costs associated with capital equipment and dedicated transmission lines.

"We have launched NNCS as a network service for our business customers which enables secure connections between LANs and PCs," says Shigeru Ikeda, executive vice president of NTT's multimedia business department. "At NTT, we are working on ISDN and multimedia services such as Future Multimedia Now-ISDN and the ISDN Interface Multimedia Conferencing System Phoenix, solidifying NNC's importance in the realization of multimedia networks."

Novell is represented in India by the Bombay-based Onward-Novell. Novell has also an Indian subsidiary Novell Software Development India, Bangalore.

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MISCELLANEOUS

Apple's Yet Another Computer Yatra

Apple Computer has announced its plans for this year's Apple Yatra through India. Targeted at the publishing, multimedia, and creative community in the country, the highlight of this year's Yatra will be the announcement of Apple's Masters of Media programme - a worldwide programme. The programme will enable users to master the media through the effective usage and management of various media technologies. The programme seeks to bridge the needs of media-centric industries like publishing, new media, entertainment, and multimedia content creation.

Apple's 1996 Yatra, held in nine Indian cities through August and September, is a sequel to the popular 14 city Yatra that Apple Computer launched in India last year. The one-day technology symposium series commenced in Mumbai on August 20th. It presented the latest technologies, tools, and products available from Apple and its third party solutions partners like Adobe, Macromedia, Strata, Avid, LinoType Hell, Fractal, and so on.

ISO 9001 Certification For Mindware

The Bangalore-based Mindware, software exports division of PCL, has recently received ISO 9001 (TickIT) certification from BMT Quality Assessors Ltd, UK, one of the premier institutions in the world for quality assessment. Mindware was recommended for unconditional certification, which according to the BMT QA auditor, was a rare feat.

The implementation of ISO 9001(TickIT) program was launched by Mindware in December 1995.

Mindware, operating in software development and consultancy, provides its clients with technology solutions from a business perspective. It has created Specialised Technology Domains to provide focused services to its clients. Mindware provides on-site, off-site, and off-shore services through dedicated software labs, remote maintenance, product development, turnkey projects, and on-site consultancy.

BMT QA is one of the very few accredited bodies in the UK government to carry out ISO 9001 certification under DTI TickIT scheme. It provides assessment and ISO 9000 certification for a wide range of business activities in defence, maritime technology, construction, engineering, electronics, software industry, and operates extensively throughout the world.

Lotus Posts Specifications For Internet C&S

Lotus Development has announced the availability of the Internet calendar access protocol (ICAP) specifications for Internet calendaring and scheduling (C&S). The ICAP is now available on Lotus Web site for evaluation by customers and Internet users.

ICAP would allow clients and servers to exchange C&S information over TCP/IP networks. This would create seamless C&S interoperability across corporate intranets and the Internet using a wide variety of C&S products.

It would allow users to browse and look for free times in other users' calendars providing proper access is granted to schedule meetings with other users to conduct on-line searches of calendar information, and to selectively retrieve calendar information.

The Lotus web site, http//www lotus.com/calendar/, has ICAP specification for evaluation.

Mark Maltese Joins WideCom

Mark Maltese, vice president (marketing), Xerox Corp., has joined WideCom as president for US sales. Raja Singh Tuli, CEO, WideCom Group, says, "Mark will be a great asset to WideCom. His extensive marketing and sales background and his experience in developing business in the United States will be of tremendous value to both the company and our clients." Mr Maltese will look after expanding marketing operations and augmenting WideCom's current regional offices in Chicago, Atlanta, and Maryland in USA. Mr Maltese holds a BSc degree in Information Management Systems from the University of San Fransisco in California, USA. The WideCom Group designs, manufactures, and markets high-speed wide-format document management systems.

Umang Gupta to Address Akshay-NCST Seminars

Umang Gupta, the founder of Gupta Corp., USA, now renamed Centura Software Corp., will address futuristic seminars, jointly organised by Akshay Software Technologies Ltd(ASTL) and NCST, on "Client/Server Meets the Internet." These seminars will be held in India in early September next.

The seminar will describe the potentially explosive union of the two technologies both in terms of business benefits for Indian organisations and trends this synergy will set for the industry as a whole. These seminars will be followed by a practical demonstration of client/server Internet integration using Akshay's Centura range of products. These seminars are scheduled to be held in Bangalore, Madras, Calcutta, and New Delhi on September 7, 9, 11, and 12 respectively.

ASTL is a leading IT and and management consultancy organisation, specializing in turnkey software engineering solutions. Its focus areas are client/server and 4GL technology. ASTL represents Centura Corp. and is the sole distributor for its products, sales, and services in India.

Product Reviews in *PC Magazine India* enable decision makers in the corporate sector to select the products that meet their specific requirements.

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IT SHOWS

Exhibition/Fair	Brief description	Date	Venue	Contact
DYNAMIC COMPUTER FAIR	An exhibition on office automation, communications, database services, and other information technology areas. Technology- and industry-oriented seminars will also be conducted.	6-8 Sept. '96 25-27 Oct. '96	Hyderabad Cochin	K.K. Raman Meera Dynamic Company Rosy Tower 7 Ningambakkam High Road Madras 600 034 Tel: 8263608/2580; Fax: 8282592
CSI '96	An IT show targeting computer users. IT manufacturers and service providers will display their wares. Business opportunities can be explored.	Oct. 30- 3 Nov. '96	Bangalore	M. Dayanand 401, 4th Floor, M.B.C. 134 Infantry Road Bangalore 560 001 Tel: 5511511; Fax: 5562971
COMDEX/FALL '96	A major platform for buyers, sellers, and decision-makers. On display will be the latest in products and services, including computer hardware and software, multimedia, networking solutions, communications, Internet, education and training programs, computer-telephony integration, mobile and wireless computing, and ISDN-related hardware and software.	18-22 Nov. '96	Las Vegas	Business India Exhibitions Wadia Building, 17/19 Dalal Street Bombay 400 001 Tel: 2663449/1425 Fax: 2664364/2041974
INFOCOM '96	An exhibition of computer, communication, networking, and telecom products and services for banking, business, and corporate sectors.	19-22 Nov. '96	World Trade Center Bombay	The Organiser Infocom '96 Exhibition 4A Naaz Building, Lamington Road Bombay 400 004 Tel: 3860436/3851781 Fax: 3874915/6260478
COMPONEX '96	A conference and exhibition of electronic components, materials, and production equipment.	25-28 Nov. '96	World Trade Center Bombay	Electronics Today A4 Naaz Building, Lamington Road Bombay 400 004 Tel: 3860436/3851781 Fax: 3874915
IT ASIA '96	The number one IT industry show of the country with active participation of IT delegations from the US, Europe, and South East Asia.	4-7 Dec. '96	Pragati Maidan New Delhi	MAIT, PHD House, 4th Floor Opp. Asian Village New Delhi 110 016 Tel: 6855487; Fax: 685 1321
COMMUNICATIONS '96	An IT exhibition on communications products and technologies. Good platform for forging commercial and business alliances.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647688 Fax: 4633506/4648692
BROADCAST CABLE & SATELLITE INDIA '96	A major international exhibition and conference on professional camera, lighting, sound, movie and video production, post-production products, radio and TV broadcasting, and cable and satellite systems.	8-11 Dec. '96	Pragati Maidan New Delhi	Exhibition India C390 Defence Colony New Delhi 110 024 Tel: 4622710/4622711/4647688 Fax: 4633506/4648692
BUSINESS TO BUSINESS '96	Show on office products and services, including computer hardware and software, and communications.	18-21 Dec. '96	Bombay	The Assistant Manager— Coordination Conventions & Fair India 157 Princess Street Bombay 400 002 Tel: 2060808; Fax: 2080171

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Crash Course in VisualBasic 3

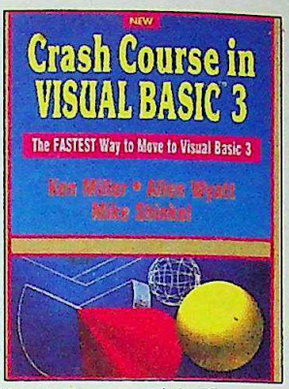
By Ken Miller, Allen Wyatt, and Mike Shinkel

Prentice-Hall of India, M97 Connaught Circus, New Delhi 110 001

Price Rs 95; Pages 230

In an age wherein speed is the very breath of life, crash courses have a place in the sun. The philosophy of these courses is very simple: You learn something new without any fluff getting in your way. The present book is one of several books in Que's series of crash course titles.

The book is a tutorial of the Visual Basic language. Though concise, it gives the most important aspects of Visual Basic. There are 10 short and clear lessons designed for speed, with brief code snippets to illustrate the points. More difficult concepts are explained in enough details to make comprehensible the underlying ideas.



With Visual Basic offering the advantage of working with the world's most popular GUI, MS Windows, a programmer has much to gain by adding Visual Basic to his bag of programming tricks. This book provides adequate knowledge to enable a programmer write Visual Basic programs. The book will show the reader how to take the fast track to developing Visual Basic applications; work with forms, events, and properties; follow techniques on variables, operators, and built-in functions; build professional dialog boxes easily with customized text and fonts; fine-tune programs with tips on program flow and data structures; and debug, fix, and run the finished program.

Foundations of World Wide Web Programming With HTML and CGI

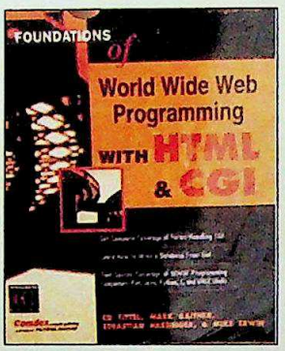
By Ed Tittel, Mark Gaither, Sebastian Hassinger, and Mike Erwin

Comdex Computer Publishing (a division of Pustak Mahal), 10B Netaji Subhash Marg, Daryaganj, New Delhi 110 002

Price: Rs 450 (with CD-ROM), Rs 345 (with disk); Pages: 664

If you are running a serious web site, this book will demonstrate how to use advanced HTML (HyperText Markup Language) and CGI (Common Gateway Interface) to make Web programs very powerful. How do you transform static, one-way Web pages into a sophisticated, interactive environment that people respond to? The present book will enable you to find the tools you need to create high-quality, interactive Web services that support complex user transactions.

The book, running through 34 chapters, is divided into four parts. Part I, from chapters 1 to 9, covers the terminology and programming tools, interfaces, and techniques employed throughout the rest of the book. Part II, running upto chapter 17, is the bridge leading you from these fundamentals to real-world CGI, including the implementation and



testing of a sample set of forms-handling. This part begins by taking the design for the forms-handling CGIs, proceeds to implement the necessary code in chapter 10, and further through testing and debugging process in chapter 11. The next five chapters explain the writers' own CGI development environment, followed by a short tutorial and examination of tools and techniques that let you locate and use prefabricated CGI code and libraries in your programs, to advance your development efforts. Part III covers basic CGI programming elements and techniques, with an emphasis on the basic services and operations that CGI programmers need to learn and use. The discussions include Multipurpose Internet Mail Extensions (MIME) formats used to create Web files and documents, as well as information on how to index, access, and search large collections of data using the Web. Part IV introduces the reader to some advanced CGI programs and techniques, including Web-based audio, video, multimedia, DBMS access, real-time interaction, and so on.

Modern All about Motherboards

By Manohar Lotia and Pradeep Nair

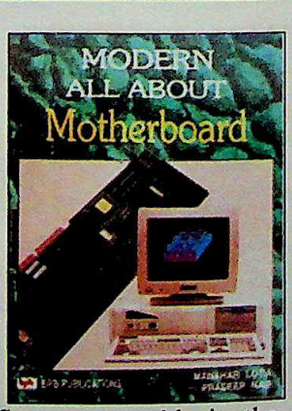
BPB Publications, B14 Connaught Place New Delhi 110 001

Price: Rs 150; Pages: 330+

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A book without any introduction, like the present one, is likely to leave the reader confused, because he doesn't know for whom the book is meant. Add to this confusion the confusion caused by the title of the book. *All About Motherboards* would have been a more appropriate title. Nevertheless, the book is useful, because books totally devoted to motherboards are few and far between, inspite of the fact that publishing houses are churning out computer books like never before.

While the editing is poor, the book is very informative and can be read by the beginner, for simple explanations of the most advanced terms used in computing, as well as by the advanced user of PC, for a better comprehension of terms he has used and read, but not delved deeply. The book runs through 11 chapters. The book begins with a simple description of what is a motherboard, and goes on to explain the types of motherboards and motherboard components. The second chapter briefly talks about expansion slots. Chapters 3 and 4, dealing with CPU and memory respectively, are perhaps redundant in a book whose focus is on motherboards, as also the following two chapters on upgrading memory and BIOS.



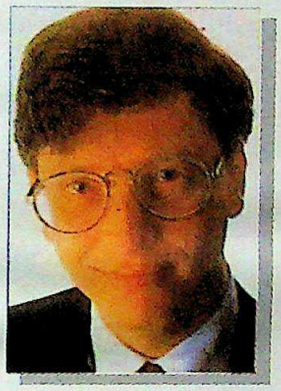
Probably the writers have felt that no book on computers is complete without discussing these subjects. Support circuits, discussed in chapter 7, dispel the common belief among many PC users that the comuputer works on just microprocessor and memory. While so far the focus of the book is on motherboard and its parts, the next chapter is on upgrading an old motherboard, followed by one on BIOS setup. Chapter 10 gives a good idea of some 386 and 486 motherboards commonly available in the market. The book winds up with a chapter on motherboard troubleshooting.

The simplicity with which the book deals with even complex subjects is its special feature. A must for a PC novice who wants to understand a PC more than merely operating it.□

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WHAT THE FUTURE HOLDS FOR SMALL BUSINESSES



"One small business owner I know hopes, starting next year, to stop doing business with accountants, lawyers, consultants and other service suppliers who don't use the Internet routinely and comfortably. He's had a taste of how effective electronic collaboration between companies can be and says there's no turning back. If he can't persuade his suppliers to embrace the Internet, he plans to find new relationships with people and companies who do."

What does the future hold for small businesses? What opportunities and threats do they face because of future technology?
Small businesses will become more numerous and specialized, and the size of the average business will get smaller as computer networking allows easy, efficient collaboration between people regardless of where they work.

As the Internet changes the way business is done, companies won't need to have as many resources on hand as they do now. Companies of all sizes will focus on what they do well, their "core competencies," and leave other tasks to specialists at outside companies.

Many companies, including Microsoft, already are moving in this direction. For years we've used contractors for a large number of tasks that are important but not central to what we do.

We recently agreed to sell our US software packaging and disk-duplication facility to a company that specializes in manufacturing packaged software. We'll work hand-in-hand with the manufacturing company, but I want Microsoft to focus on software creation, marketing and support—our core competencies.

As the boundaries that separate companies become less important, employees will readily get advice and share ideas or information with colleagues in and outside companies. An engineer who used to consult with an in-house graphic designer or an in-house employee-benefits specialist will instead work just as closely with outside specialists—via the Internet.

Because the need for physical proximity between companies will become much less important, many kinds of businesses will have the ability to reach a wider potential client base than ever before.

By the same token, a company may find itself facing many more potential competitors—not from just across town but perhaps from around the world. The increased competition will accelerate the trend toward specialization as companies, eager to differentiate themselves, define themselves increasingly by what they do rather than by where they are.

Many opportunities will arise for small businesses to embrace the new possibilities afforded by the Internet. Real challenges will face some companies that ignore the trends for too long.

One small business owner I know hopes, starting next year, to stop doing business with accountants, lawyers, consultants and other service suppliers who don't use the Internet routinely and comfortably. He's had a taste of how effective electronic collaboration between companies can be and says there's no turning back. If he can't persuade his suppliers to embrace the Internet, he plans to find new relationships with people and companies who do.

Many small businesses will eventually make similar decisions. Attorneys, consultants, and others will reap rewards for using up-to-date business practices that attract customers and clients.

Some middlemen will be particularly challenged as the Internet breeds new, efficient competitors. Some retail stores, for example, may find that electronic commerce cuts into their business, forcing them to redefine themselves or the way they do business. Even restaurants, which are among the smallest of businesses, will find advantages from using the Internet. It won't be long before an appreciable share of the people who regularly patronize restaurants will use the Internet to scan menus, make reservations or order food via the World Wide Web.

It's new world, and small, innovative businesses will be at the heart of it.

Is it true that you work on a Mac?
No, I don't use a Mac. I use a Windows-based laptop computer with docking stations at home and work. The Apple Macintosh is a fine system, though.

Microsoft has invested heavily in developing software for it since before the first Mac was released back in 1984. Microsoft is doing as much Macintosh software developments now as at any time in the past.

Not all computer geniuses behave like nerds. Many are outgoing and blend right into the crowd—that's part of what makes them geniuses, naturally. Your interviews almost invariably portray computer people collectively as nerds. Have a heart, will ya?
It's considered cool these days to be wired into the worlds of computers and communications, but I'm not sure anyone wants to be thought of as a "nerd."

If being a nerd means you're somebody who can enjoy exploring a computer for hours and hours late into the night, then the description fits me, and I don't think there's anything pejorative about it.

But here's the real test: I've never used a pocket protector, so I can't really be a nerd, can I?

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THE YEAR 2000: HOW BIG A HEADACHE?

It is true that the worldwide computer community is going to have a massive headache when we reach Dec. 31, 1999? Has Microsoft addressed the problem and if yes, how so? I can't help wonder how this situation got past so many programmers and company executives.

There will be a headache but how much pain it will cause remains to be seen. One computer services company has called on government to begin spending money now to avoid "a catastrophe of global proportions."

This may overstate the problem but it's true that beginning in the year 2000 some programs that compare dates will start making mistakes. Errors could appear in the behavior of software that computes interest, organizes information chronologically or figures out a person's age.

A computer could miscalculate your age and deny you retirement benefits. Inventory systems could order stock at the wrong time and in the wrong quantity. Financial deadlines could be missed.

The underlying problem is that certain computer programs, primarily ones written years ago for mainframe computers, hold only the last two digits of the year when storing a date. The year 1996 is stored as 96, the year 1997 as 97.

For the first 50 years of the computer age, the two-digit shortcut didn't pose much difficulty. In the early years, shortcuts such as this one were necessary because programmers had to coax as much performance as possible from machines with limited memory and storage.

But a little more than three years from now, when Dec. 31, 1999, gives way to Jan. 1, 2000, at the turn of the century, the programs that still use the two-digit year shortcut may not be able to tell the difference between the years 1990 and 2000.

The good news is that most PC users won't be affected. There shouldn't be much of an issue with up-to-date personal computer software. Microsoft software, for instance, won't cause problems. The bad news is that some businesses and agencies that still rely on aging mainframe software will face a challenge.

Mainframes have been called software museums because it's not uncommon for mainframe software written 30 or 40 years ago still to be in use. Back then no one was worrying about the end of the century.

Some PC users will face problems at the end of the century, too. Usually this will be because a PC is hooked up to a mainframe or because the PC is running a custom-built software application developed for one company's use.

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Custom software applications, including macros, sometimes don't meet the same rigorous programming standards as commercial applications.

Before the year 2000, companies that rely on old software or custom software need to examine it. This will be expensive when there are millions of lines of programming code to be reviewed, especially if the people who wrote the code have retired or died.

I don't want to make too much of the date problem because it's only one example of how changes in the world force companies to reevaluate their software. Changes in tax laws reporting requirements and even product lines can prompt the modernization of company's computing systems.

Do you think that too much reliance on th computer for mental stimulation an knowledge actually causes the brain t decrease in capacity?

On the contrary, the computer stimulate your brain in a very positive way. Unlike th TV, which provides a group experience, th computer engages you with an individu experience. Its interactivity lets you pursu your interests.

I'm one of those people who thinks kid ought to learn how to multiply with a penc and paper even though calculators can do for them.

But at the same time, I have no doubt th computers can help kids develop more their mental potential.

I was quite surprised to hear about you recent acquisition of the Bettman Archive. I think it's interesting that yo chose to invest in an institution so diffe ent from your software business. I wi wondering if you had any plans for th archive which you could share.

The Bettmann Archive is a collection of million photographic images that chronic the past century. It's a treasure that deserv to be widely available to people through the world.

The archive was purchased last year Corbis, a company I founded in 1989 that entirely separate from Microsoft.

The mission of Corbis is to take imag of all types—from great photographers li Ansel Adams from leading museums a from historical collections such as t Bettmann Archive—and make them easi accessible in electronic form.

We are digitizing images at very hi quality, and we'll make it straightforwa for people to buy the right to use the image We expect many of the transactions to ta place on the Internet.

Eventually millions of people all over t world will have access to electronic imag from the Bettmann Archive, including t entire photojournalism library of the Unit Press International (UPI).

The idea that millions of people would able to draw on millions of images wou have been almost unimaginable only a fe years ago. It's exciting to help play a role making this happen.

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